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EDITORIAL.

TUBERCULOSIS AND THE SERVICES.

THE study of tuberculosis amongst our Naval and Military Forces is a subject of national importance. Through the valuable co-operation of a number of experts, we are able to present in the present number a series of contributions dealing with the incidence of tuberculosis in the Services.[1] The question demands serious and thorough investigation. Any great or undue prevalence of tuberculosis in the ranks of our soldiers and sailors would be a calamity for the Empire. It is gratifying, therefore, to realize, from evidence now available as regards the occurrence of tuberculosis in the Navy and Army, that in the latter it is considerably less frequent, and in the former certainly not more prevalent, than amongst the males of the civil population at the same age. Another very important point brought out in the papers we now publish is that this condition of affairs is very different from that which obtained forty to fifty years ago. In 1860 the Navy lost more than 2 men per 1,000 by death and nearly 11 per 1,000 by invaliding as the result of tuberculous diseases, while the losses in the Army were slightly under 3 per 1,000 from death and over 3 from invaliding. The death-rate of the males of the civil population of the same age was, in 1860, only 3·5 per 1,000. It is obvious, therefore, that the sailor and the soldier of 1860 ran a far greater risk of tuberculosis than did their brothers who remained in civil occupations. Now the case is reversed. The cause of this change is undoubtedly the great improvement which has taken place in the hygiene of both the Navy and the Army, and

[1] We desire to express our obligation and thanks to Lieutenant-Colonel C. H. Melville, R.A.M.C., Secretary of the Medical Advisory Board of the British War Office, for much valuable advice and great assistance, and to the various contributors who have rendered invaluable aid in the preparation and presentation of the symposium on "Tuberculosis and the Services" in this present number.—EDITOR, BRITISH JOURNAL OF TUBERCULOSIS.

particularly in respect to "housing." The problem of housing, however, as it presents itself to the naval architect, is very different from that which the designer of a barrack has to face. A battleship is primarily a floating gun-carriage, and all other objects, including the comfort, and, to a certain extent, the health of the crew have to be subordinated to the paramount consideration of making the battleship the most efficient gun-carriage possible. A barrack, on the other hand, does not, at least in the principles of its construction, differ materially from a prison or a workhouse, or any other institution where a considerable number of men have to be accommodated under one roof. That, notwithstanding the manifest disadvantages under which ships and crews have to live, the "tuberculous waste" of the Navy should be as low as it is reflects great credit on the medical officers of our senior Service. It is doubtful whether much further improvement can be looked for in the future, however, along these lines. Education may be expected to teach the class from which our sailors and soldiers are drawn the necessity for personal hygiene and the importance of fresh air in the house, concerning which they are now sadly deficient. They may also possibly be brought to understand the danger of promiscuous expectoration.

The question of invaliding from the Services for tuberculosis is one which is obviously of great importance to the general civil population. If it could be proved that the life of the sailor or the soldier tended to make him more liable to tuberculous infection, then it could fairly be urged that the Admiralty and the War Office should hold themselves responsible for the subsequent care of the men who had contracted the disease during their term of service; but since the evidence is distinctly in the other direction, it is obvious that the naval and military authorities cannot be held responsible for increasing the amount of tuberculous disease in the general population. This being so, it may justly be urged that the plea for the construction of special sanatoria for sailors and soldiers invalided for tuberculosis is not a reasonable proposition. It is now generally agreed that the influence of these institutions is mainly educative, and it is doubtful if the invalided man is likely to learn more regarding the care of his person and the maintenance of hygienic routine in a sanatorium than he should have learnt in the three or four months during which he has presumably been under treatment in hospital prior to discharge. The constant addition, however, of a considerable number of consumptive short-service men to those dependent on charitable and Poor-Law relief adds no little to the practical difficulties of adequately dealing with our tuberculous poor.

As regards recruiting, it is stated in the Army Medical Department Report for 1905 that 1·26 per 1,000 of recruits examined during the year were rejected on the ground of tuberculosis, and that 0·19 per 1,000

of men enlisted were discharged as unfit from the same cause during the first three months of their service. Of these last it may probably be stated with confidence that almost all had the disease latent at the time of enlistment, though without definite physical signs. This is the more probable, since the first three months of a recruit's service are not likely to increase his liability to contract tubercle, his food and housing being in most cases incomparably better than he has been accustomed to prior to enlistment, and his training tending, if anything, to improve his pulmonary condition. Therefore, it may be fairly assumed that of the class from which recruits for the Army are chiefly drawn, about 3 per 1,000 either have actual signs of tuberculosis or harbour the disease in a latent form. This fact may become of peculiar interest, in view of the proposed formation of the Territorial Army. Unfortunately, there are no reliable statistics referring to the prevalence of tuberculosis among our Auxiliary Forces.

Reference may here be made to the relative prevalence of tuberculous disease in the various Armies of the Great Powers. An exact comparison is not easy, as the conditions of service vary so greatly, and of course racial peculiarities have also to be considered. The French Army gives by far the highest ratio of admissions, the Austro-Hungarian and German the lowest; while the Armies of England and Russia occupy about a middle place between these two extremes. Of more importance, however, is the relative prevalence of tuberculosis in the American and British Armies. Here the conditions of service are more comparable and the racial difference negligible. In the report of the Surgeon-General of the American Army for 1906, the death-rate for this class of disease during 1905 is given at 0·86 per 1,000, compared with 0·31 for the British Army during the same year. It is noteworthy, too, that this ratio is the highest of a steadily increasing series, dating back to 1897, in which year the death-rate was only 0·33 per 1,000. At the same time, upwards of 3·67 men per 1,000 were discharged the Service unfit, during the same year, as the result of tuberculosis, as compared with 1·56 per 1,000 in the British Army serving at home. Tuberculous disease was most prevalent in the department of the Gulf, and next to this in that of Columbia. The medical officer at Fort Moultrie gives an interesting account of the dissemination of the disease by expectoration, as follows: "The barracks at this post are heated by hot-air furnaces, with not a few floor regulator registers, one of these at the foot of the stairway. It is the place, of all others, where men in passing will expectorate, and at all times a draught of hot air coming through these registers quickly disseminates any infection in its virulent form." These remarks have an interesting bearing on the question of the relative value of the heating of barracks by hot air, open fires and radiators.

Tuberculous diseases are essentially diseases of peace-time. In war they have, fortunately, but little significance. Thus, in the Nile Campaign of 1884-1885 the death and invaliding rates from tuberculosis were 0·37 and 0·65 per 1,000 respectively, the general rates for the whole Army at home and abroad being, on the other hand, 1·34 and 2·9. In the South African War the deaths among the regular troops were 0·36 per 1,000—about one-half that of the years immediately preceding the war. This is due, in part at least, to the careful inspection which the men have to undergo before proceeding on active service. Thus, the death-rate amongst the Colonial troops was nearly twice as high as that of the Regulars, though they were, in all probability, more inured to a campaigning life than the soldiers of the British regiments. A great deal, however, depends on the fact that a campaigning life is, as far as the respiratory system goes, a particularly healthy life. The medical centre of gravity, if the expression may be allowed, is shifted from the lungs to the intestines. At the same time, owing to the numbers of men kept back from the front suffering from either incipient tuberculosis of the lungs or showing signs of chest weakness, the rates for the rest of the Army, not serving in the field, tend to rise. This fact is noted in Lieutenant-Colonel Melville's paper, though no explanation is assigned.

Very interesting points are raised in the papers on the Egyptian and Indian Armies relative to influence of race on the incidence of tubercle. There is room for interesting research here to ascertain whether there is a real racial immunity, or whether the non-occurrence of the disease is due to unfavourable geographical conditions or to non-importation of the disease. For instance, it would be interesting to know if the Gurkha in Nepal suffers from tuberculosis to the same extent as he does subsequently to enlistment. The point is obviously worth elucidation.

In regard to racial proclivity, it is interesting to note that in the Third Report of the Henry Phipps Institute, of Philadelphia, attention is drawn to the extraordinary liability of the Irish race to phthisis, and the power this race has of impressing this peculiarity on the offspring of mixed marriages, where one of the parents is Irish. It has several times been pointed out that Irish regiments, and Irishmen in other regiments, seem to suffer more from tuberculosis than either Englishmen or Scotchmen. This racial question thus invades even the comparatively homogeneous population of these islands. Research here might be of real value.

We clearly stand in need of more precise knowledge regarding the prevalence and production of tuberculosis in its various forms, and the best means to ensure prophylaxis in the Services, but we venture to hope that the articles we are enabled to present herewith will further study and advance practical reform.

SPECIAL ARTICLES.

TUBERCULOSIS IN THE NAVY, 1860-1906: Its Influence on Invaliding and the Death-Rate.

By WILLIAM WENMOTH PRYN,
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During the last fifty years the changes in nomenclature have been so considerable that it has become somewhat difficult to decide what diseases should be regarded as having been due to the tubercle bacillus. From 1860 to 1868 scrofula and phthisis and hæmoptysis (the last two under one heading) appeared in the statistical reports. From 1869 to 1878 scrofula and phthisis pulmonalis were shown under General Diseases, and hæmoptysis under Diseases of the Respiratory System. In 1879 the heading Tubercular Diseases first appeared in the returns, and under this were shown all cases of phthisis and scrofula until 1886, when, in consequence of a revised classification in the nomenclature of diseases, pneumonic phthisis appeared under Diseases of the Respiratory System. The result of this was that practically all cases of phthisis were returned under the new heading, and the invaliding and death-rates from tuberculous diseases fell from 3·38 and 0·59 per 1,000 in 1885 to 0·04 and 0·04 respectively in 1886. Since 1897 all affections ascertained to be due to tubercle have been returned as tubercular diseases.

The transference of cases from phthisis to tubercle has, however, been a gradual one, as will be seen from the accompanying table.

It is evident that, in order to get results which are comparable, the returns under the following headings occurring at different times in the statistical reports must be taken throughout: Scrofula, Phthisis Pulmonalis, Pneumonic Phthisis, Phthisis, Hæmoptysis, and Tubercle. Let it be understood, then, that, for the purposes of this paper, all the above are regarded as tuberculous diseases.

It is advisable to explain as to what constitutes invaliding. At home an officer or man medically unfit for further service is invalided and discharged; but abroad the subject medically unfit for further service on the station is invalided, and sent home when fit to travel.

Table indicating Proportion of Cases Invalided from Tuberculous Disease.

TOTAL FORCE—NUMBER OF INVALIDS.

Year.	Tubercle.	Phthisis.
1897	84	297
1898	139	236
1899	187	183
1900	206	175
1901	311	98
1902	339	69
1903	344	42
1904	367	66
1905	338	53
1906	216	51

He is returned as having been invalided; after treatment at home he may recover completely and be sent to duty. If he does not recover, and is not likely to become fit for further service, he is finally invalided, and ceases to be on the active list of the navy. In this case he is shown in the return still as one invalid. In the event of the patient who has gone to duty being invalided a second time, he causes two entries to be made under "invalided."

The chart accompanying shows the invaliding and death-rates (ratio per 1,000) from tuberculosis for the total force from 1860 to 1906.

Historical Survey.

It will be seen that at the commencement of the period the invalidings were very numerous; that they fell rapidly at first, gradually afterwards until 1889, since when there has been a rise, followed by a decided fall in the last two years. The death-rate was very high in the early years; it fell gradually up to 1881, remained moderately stationary until 1904, since when there has been a pronounced subsidence. The marked fall in both rates for the last two years, and the fact that the invaliding and death-rates for 1906 (the last year for which statistics are available) were the lowest on record in the period under consideration, are noteworthy. The rise in the invaliding rate subsequently to 1889 may possibly be explained by the predisposing influence of influenza, in which year this fell disease commenced its last visitation.

Naval Hygiene.

Tuberculosis has undoubtedly caused a very great loss to the service, both by invaliding and death. The seaman spends a very large proportion of his service in ships. In some cases on foreign

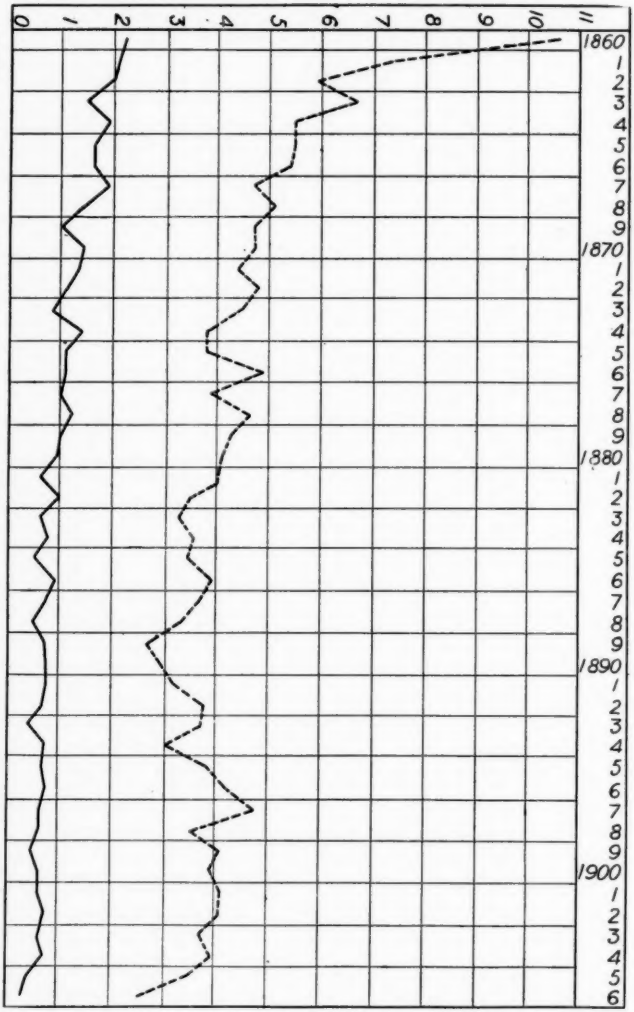
stations he does not leave his ship for prolonged periods. Now, a ship of war is primarily an engine of destruction, which for the efficient discharge of its functions requires large numbers of men to be accommodated on board in living spaces which cannot be described as other than cramped. The prophylaxis of tuberculosis in the navy is intimately associated with the problem of keeping these living spaces in good sanitary condition. The seaman himself is the victim of circumstance; he has to sleep where he is ordered. At sea the safety of the ship may necessitate the closure of ports, etc.; natural ventilation is thus reduced to a minimum, and the very great responsibility of supplying fresh air by making full use of every available artificial means devolves on the officers.

Apart, however, from the interference with natural ventilation, the matter of density of population is probably a most important factor. H.M.S. *Impregnable*, the training establishment for boys at Devonport, consists of two ships, which are afloat in the harbour, but do not go to sea. The necessity for the interference with natural ventilation is, therefore, non-existent. The Royal Hospital School is situated at Greenwich on the outskirts of the Metropolis. Both establishments accommodate, roughly, 1,000 boys of the seaman class; all are subjected to careful medical examination; all are well fed and generally well supervised. Yet in the ships the entries to the sick-list for tuberculosis for the five years 1902-1906 amounted to twenty-four, while those for the school were six only. There is this great difference between the two establishments, that whereas the school is scattered over an area of 16¼ acres, the ships occupy a space of ½ acre only.

Tuberculosis being an infectious disease, and the seaman being forced under the conditions of service to live intimately with his fellows, it becomes necessary to eliminate all who are likely to spread contagion. It may be laid down as a general rule that when an officer or man is proved to have contracted tuberculosis of the lungs, he should not again be allowed to serve in ships, and an early invaliding is indicated. This course is necessary in order to safeguard the crews of H.M. ships, and it acts also for the benefit of the patient, who, when apparently recovered, would in all probability very soon break down under the conditions of ship life and become a source of danger. This, at least, represents the opinions of competent medical officers who have spent their professional lives in the service. Clinical evidence also frequently supports this contention. Several officers, who had returned to duty after suffering from lung trouble, having again broken down, have recently been discharged.

Some civil practitioners may perhaps disagree with these views, and will probably be inclined to regard as fit for general service a subject who seems to be in good health, and in whom the signs of

active disease have disappeared. It is given to the naval medical officer, however, to have a practical experience of life in a ship of war,



CURVES SHOWING INVALIDING AND DEATH RATES PER 1,000 OF STRENGTH FOR THE ROYAL NAVY FROM TUBERCULOSIS, FROM 1860 TO 1906.

Invaliding rate ..... Death rate ——

and to be intimately acquainted with the strenuous nature of service in the navy.

Mortality Returns in the Navy.

The death-rate in the navy is liable to considerable fluctuations on account of accidental circumstances; thus the loss of H.M.S. *Atalanta* in 1880 caused 279 deaths from drowning; that of H.M.S. *Serpent* in 1890, 173; and the *Victoria* disaster in 1893, 358. In order to eliminate the effect of these accidental circumstances a study was made of invalidings and deaths from tuberculosis expressed as percentages of invalidings and deaths from disease only, the invalidings and deaths from injuries being excluded.

In the case of invalidings the initial fall and subsequent rise were found to be most pronounced. In the case of deaths the percentages remained high for the first twenty years, were much lower, though tending to rise, during the next twenty years, and in 1903 the figure 22·9 was attained, a rate which has not been exceeded during the whole of the period.

The increase in these percentages from the early eighties up to quite recently tends to show that efforts to combat tuberculosis have been less successful than those which have been directed towards the prevention of other diseases.

Special attention to the prophylaxis of tuberculosis in the navy is, therefore, indicated, with a view to bringing the loss from this disease in a line with the loss from other causes.

Present-Day Principles of Naval Hygiene and Anti-Tuberculosis Measures.

A bacillus which in the past has caused such a large loss to the service, which even in this twentieth century has occasioned average invaliding and death-rates of 3·63 per 1,000 and 0·54 per 1,000 respectively, and as lately as 1903 accounted for 22·9 per cent. of all deaths from disease, should be subjected to vigorous and continuous attack.

Some idea of the manner in which hostilities were conducted in former times may be gathered from the account of the troubles of the *St. Jean d'Acre*, which is to be found in the *Statistical Report* for 1860. The recognized mode of attack to-day may be briefly put thus:

1. The construction of ships with commodious living spaces as near to the upper deck as possible.
2. The adoption of the most approved methods of ventilation—natural and artificial.
3. The making full use of such means as are provided for the supply of fresh air and the extraction of foul.
4. The careful selection of the personnel.
5. Observance generally of all hygienic requirements.
6. The efficient disinfection of tuberculous discharges.

7. The efficient disinfection of infected articles and infected living spaces.

8. The isolation of tuberculous men.

9. The removal of patients from ships to hospital on the earliest opportunity.

10. Early invaliding.

The discharge to their homes of men invalided for tuberculous diseases is undoubtedly a danger to the health of the civil population. To what extent it has suffered in the past from this cause is unknown.

The building, equipment, and maintenance at Admiralty expense of sanatoria for the treatment of men who are unfit for further service are, however, measures which can scarcely be regarded as practicable.

TUBERCULOSIS IN THE ARMY, 1860-1906: Its Influence on Invaliding and the Death-Rate.

By Lieutenant-Colonel CHARLES H. MELVILLE,

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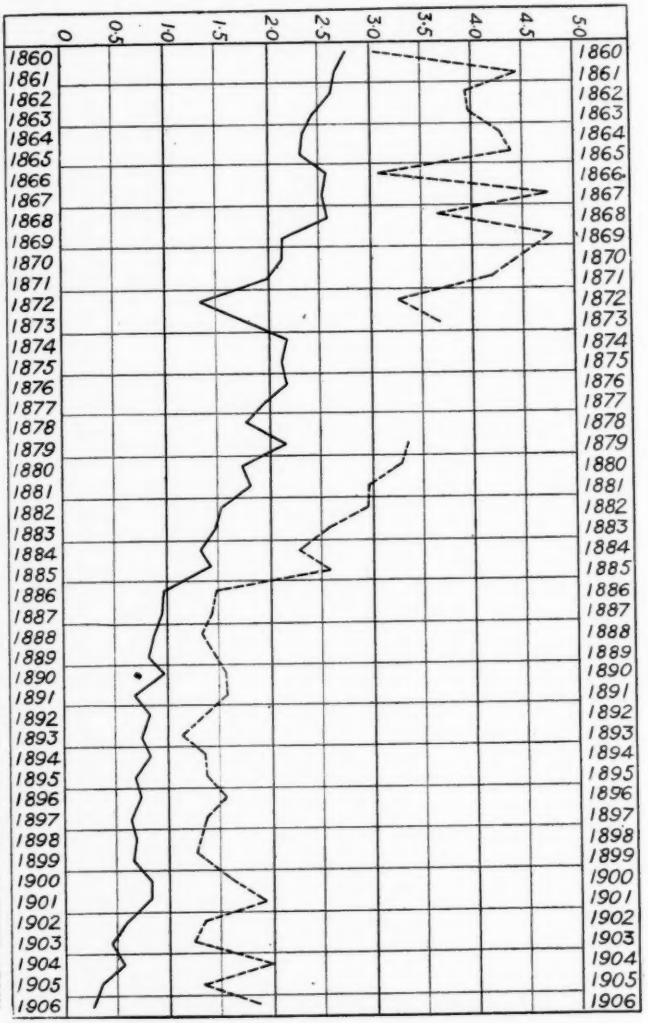
Tuberculosis being, especially in its pulmonary manifestations, a disease of the young adult—and, to a certain extent, of the young male adult rather than of the female—possesses peculiar interest for the Army Medical Officer. Other of the more chronic forms of disease, *e.g.*, syphilis, cause waste by invaliding, while the acute infections deplete the ranks by death; but tuberculosis strikes with both weapons. Thus during the year 1906 tubercle of the lung caused, in the army serving in the United Kingdom, more deaths than any other form of disease except pneumonia, and was responsible for more invaliding than any other single disease, or group of diseases. Taking the entire army, serving both at home and abroad, we find that even the exigencies of foreign service, and exposure to tropical climates, do not serve to oust this disease from its "bad pre-eminence" as a cause of invaliding, and only bring it one step down the list of causes of mortality, enteric now taking its place as second on the list.

In studying the history of tuberculosis in the British army I have relied entirely on the statistics given in the Annual Reports of the Medical Department. These give the most accurate information, though,

when taken in a long series, continuous comparison is hampered by changes in nomenclature and classification. For this reason it has been found impossible to limit the study to that of tubercle of the lung alone, since for many years this was not shown separately from other diseases due to the same cause. Except, therefore, where definitely so stated the reference to tuberculous disease includes tuberculous disease of all kinds.

The accompanying chart shows the yearly fluctuations in the invaliding and death rates for the entire British army, at home and abroad, since 1860 inclusive. Unfortunately, the invaliding rates for the years 1874 to 1878 inclusive cannot be shown, as during these years the Army Medical Department reports class tuberculous disease under enthetic diseases, and do not furnish separate figures. Taking the death-rate first, it will be seen that there has been a steady fall in the ratio of deaths during the period under review, broken by only two important rises. The first occurs in the years 1872 and 1873, and its effect is seen to last till well into the early eighties. The second rise occurs during the years 1900 and 1901, the years of the South African war, to which campaign it is undoubtedly attributable. The cause of the first and most important rise is difficult to estimate. Probably there was more than one cause at work, but the Army Medical Department reports give no information as to what these may be. There were, however, two important changes at work during those years, which may not impossibly have had some share in causing this exacerbation of a previously declining cause of mortality. The first of these was the gradual introduction of short service, which was commenced in a tentative way in 1870, and gradually extended in scope throughout the ensuing decade. The immediate result of this was naturally a considerable and increasing influx of young soldiers into the ranks, an increase, that is, of susceptible material. The second change was the alteration in the constitution of the Army Medical Service from a Regimental system to a Departmental system. The dislocation of machinery necessarily consequent on all such administrative changes not impossibly led to a temporarily lessened supervision of sanitation in barracks. The curve representing the variations of the invaliding ratio is much less regular than that representing those of the death-rate. The curve as a whole shows a marked fall, but this began much later than the fall in the death-rate. Owing to the gap in the statistics during the years 1874-1878, already alluded to, it is hard to say whether the fall commenced in 1872 or later. Once the fall began it was, however, very rapid, and lasted till 1893, since when, though with considerable oscillations, the curve has had a slightly upward tendency. This rise is probably due to the recognition of the potentially infective nature of all phthisical cases. The oscillations are less easy to explain. The rise in 1900 and 1901

may be attributed to the war, but those of 1904 and 1906 cannot be accounted for. Invaliding being the result not of an operation of nature,



CURVES SHOWING INVALIDING AND DEATH RATES PER 1,000 OF STRENGTH FOR THE BRITISH ARMY AT HOME AND ABROAD FROM TUBERCULOSIS, FROM 1860 TO 1906.

Invaliding rate ----- Death rate ——

but of the opinion held by medical officers as to the effect of a disease on a man's fitness for the ranks, naturally fluctuates with the fluctuation of ideas on this point. On the whole, then, we see that in the past

forty-six years there has been an enormous reduction in what we may call the "tuberculous wastage" of the army. In 1860, with an army of under 200,000, we lost by death and invaliding from this cause 1,143 men; in the year 1906, with an army 230,000 strong, we lost only 590, a reduction of nearly 60 per cent.

In addition to this actual diminution in the "tuberculous wastage" of the army, there has been a diminution in this wastage when compared with that due to all other causes. Thus in 1860 the former represented one-fifth, in 1906 only one-seventh, of the latter.

We see, then, that during the past forty-six years there has been a great and practically a continuous fall in the wastage due to tuberculous disease, and it is of importance to ascertain in how far this may be attributed to causes peculiar to the army, and in how far it is due to influences affecting the entire population. In the year 1860 the death-rate from tuberculous diseases in the males of fifteen to thirty-five years of age in the United Kingdom was 3·5 per 1,000. In 1905 it had fallen to 1·5 per 1,000, a decrease of over 50 per cent. During the same time the death-rate of the army from the same cause had fallen from 3·4 to 0·30 per 1,000, or about 90 per cent. The comparison is not, however, strictly fair, since to the death-rate of the army we must add a certain proportion of the loss due to invaliding. What exact amount should be added, it is hard to say, but it is a fair assumption that half the total number of invalids leaving the service on this account die within the period to which their colour service would otherwise have extended. On this assumption we must, therefore, add to the death-rates one half of the invaliding rates for the years under discussion. This raises the total wastage in 1860 to 5·5, and that in 1906 to 1·16 per 1,000. The total decrease in the loss suffered by the army from tubercular diseases during the past forty-six years is thus equivalent to 80 per cent. of the loss suffered in 1860. Taking the improvement in the civil population at 50 per cent., this leaves a balance of about 30 per cent., which may be credited to improvements in the conditions of the soldier's surroundings during the above period.[1]

Now, the greatest change that has occurred in the daily life of the soldier since 1860 is undoubtedly in the direction of better housing. What his surroundings were in 1860 may be judged from the report of a Royal Commission appointed, in the year 1857, to inquire into the sanitary condition of all barracks and hospitals in the United Kingdom. This Committee presented its final report in 1860, and the following extracts bear eloquent testimony on this point: "We find that there

[1] This is probably fairly accurate under present conditions. Under the long-service conditions ruling in 1860 the proportion of invalids dying within the period to which their colour service would otherwise have extended was probably much higher: the proportional improvement would in that case be higher than here stated.

are 1,335 men, equal to one and a half regiments, living and sleeping in rooms with less than 250 cubic feet per man; that there are 15,195 men with less than 350 cubic feet per man of sleeping space; that 34,882 men have less than 400 cubic feet each; that 65,271 have less than 500 cubic feet per man; and that out of the whole force for which there is accommodation in these permanent barracks, namely 76,813, there are only 4,656 men with sleeping room exceeding 550 cubic feet each." Not only was the air-space often miserably insufficient, but in addition the construction of the rooms rendered what air there was unavailable. Thus, at St. Mary's Barracks, Chatham, 1,410 men were accommodated in casemates, the most unsuitable form of barrack-room imaginable, with only 250 cubic feet of space per man. In addition ventilation did not exist. To quote again from the report of the Commission: "We learn . . . that in 83 barracks of the United Kingdom, containing 3,130 rooms, and 42,521 men, with from 200 to 400, 500, and in very few rooms only 600 cubic feet per man, no means of ventilation whatever had been provided; that in 78 barracks, containing 2,237 rooms, and 33,601 men, with 230 cubic feet per man and upwards, ventilating arrangements, exhibiting all stages of imperfections and inefficiency, had been introduced. . . . One arrangement which we found at Northampton deserves notice. In this barrack the rooms are over stables, and above the rooms is an attic partially occupied by men. The rooms below this attic were ventilated by an opening through the ceiling into a triangular space, formed by the slope of the roof, the side wall of the attic, and the ceiling of the lower rooms. From this space there was a ventilating opening into the attic close to the heads of the men's beds, who thus would breathe during sleep foul air from the rooms below, unless there were fires in these lower rooms, in which case the men in the lower rooms would be supplied with foul air from the attics, drawn down the ventilators by the action of the fires. Perhaps no more striking illustration could be given of hopeless confusion of ideas on the whole subject of ventilation." The ultimate conclusion to which the Commission came was that there was a deficiency of over 32 per cent. in the barrack accommodation in the United Kingdom, and that "it would therefore be necessary to add about a third part to the permanent barrack accommodation buildings of the United Kingdom." Since Rome was not built in a day, it is hardly necessary to say that the recommendation of the Commission could hardly be carried into effect except through a certain number of years. The Commission was, however, armed with the somewhat unusual power of ordering the immediate execution of such improvements as might seem necessary up to a limit of cost of £100 for each barrack or hospital inspected, and to submit plans and estimates for the carrying out of works beyond this limit. Consequently, even before the submission of the report, a certain

amount of progress had been made, chiefly in the direction of remedying defective ventilation. No advance had, however, been made in the direction of diminishing the overcrowding complained of above up to June, 1860. Since then, however, much has been done, and the basis of all the recommendations of the Committee, namely, that every soldier should have 600 cubic feet of space in barracks, is now, and has for long been the universal rule.

There are still, especially at some of the remoter regimental depôts, buildings of antique structure, whose original design does not readily lend itself to modern ideas of sanitation. But the regimental depôts built in the seventies, though not, perhaps, up to date in all details, are excellent examples of good barracks in all the main essentials. Of the later barracks, built in 1900 and subsequently, nothing but the highest praise can be spoken. In addition to constructing these large new buildings, much has been done to remove the defects of the older ones. This has been done partly by improving the ventilation, partly by providing extra accommodation to relieve previously overcrowded rooms. To this improvement in housing, 99 per cent. of the improvement in the health of the army, *qua* tubercular diseases, must be credited.

There are, it is true, other changes which have helped in this direction. Of these, diminished sentry duty is one of the most important. It used to be the custom in the Army Medical Department reports to give a return showing the incidence of disease, and the various diseases in the various arms of the service. This custom was discontinued in 1876, but up till that time the increased prevalence of tuberculous diseases amongst the Guards, more especially among the Guards' Infantry, was very strongly marked. It is interesting to note that a similar prevalence of diseases of this type is noted by Roth and Lex as occurring amongst the Guard regiments at Berlin and Paris. It is almost certain that this increased liability to tubercle was due to the heavier amount of ceremonial guard duty required of these troops. At the same time Aitken's interesting observation of the increased liability of tall men to phthisis must not be lost sight of in this connexion. To a certain extent there have been improvements in the soldier's clothing, especially in his underclothing, which have no doubt had a beneficial effect. Improved feeding, especially as regards the preparation of the food, increased temperance—all such causes have helped towards the marked improvement which has occurred, but without the great advance which has been made in the housing of the soldier, all these would have been but as scratching on the surface of the evil.

TUBERCULOSIS IN THE BRITISH ARMY ON FOREIGN SERVICE.

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Tuberculosis in the army is chiefly the result of infection after enlistment; the number of cases in which an infection, latent at the time of enlistment, has developed later, is comparatively small. There is no selection for foreign service among men showing no obvious disease, so that in a series of years the distribution of the cases of latent disease may be taken as fairly uniform. Hence, if we compare the records of incidence, mortality, and invaliding out of the service at different foreign stations, we shall have some indication of the conjoint effect of climatic, social, and disease conditions in each station on the development of tubercular disease, and chiefly in men who were free from infection on enlistment.

The incidence per 1,000 gives an approximation to the number of cases actually occurring—an approximation only, because until recently one case might be, and frequently was, admitted to hospital on more than one occasion. But this affects all stations alike, and does not vitiate their comparison. The mortality (which includes the deaths among the invalids prior to their discharge from the service) taken alone is some indication of the acuteness of the disease (death before discharge being presumably associated with a more rapid course), which, although misleading from year to year, is probably a useful measure when a series of years is taken.

The total loss—*i.e.*, the sum of the mortality and invaliding—gives (except during the last few years, where invaliding has been on different lines) a measure of the severity of the disease.

The period selected is the last available twenty years—from 1886 to 1905. This is a homogeneous period as regards constitution of the army, a short-service army, barrack construction (cubic space and ventilation), clothing, and equipment, in none of which have the changes been as important as those which took place before the period began.

In order that a long and similar series might be obtained, the figures relate to all tubercular diseases, and not to tuberculosis of the lung only, although, in fact, this disease is predominant throughout.

Eight foreign stations have been selected, with the United Kingdom for comparison. The selection has been made so as to include as many varieties of climate and as many differences in the prevailing diseases as possible. The stations are as follows:

Gibraltar.—Climate good. No prevailing disease.

Malta. — Climate not unfavourable. Malta fever very prevalent during the period. Enteric fever not uncommon. No malaria.

Canada (*Nova Scotia*).—Climate good. No prevailing disease.

Bermuda.—Climate subtropical. Enteric fever very prevalent. No malaria.

Mauritius.—Climate tropical, bad. Severe endemic malaria. Occasionally severe enteric fever. Some dysentery.

South Africa.—Climate subtropical, but good. Enteric fever and dysentery prevalent. No endemic malaria.

Ceylon.—Climate tropical, indifferent. Malaria endemic. Occasional severe enteric fever. Dysentery.

India. — Climate tropical and subtropical, indifferent. Malaria endemic. Enteric fever very prevalent. Dysentery prevalent.

The results are summarized in the tables on page 18, where the averages are those of twenty years, except in South Africa, where the period is seventeen years, owing to the exclusion of the war period. The actual and probable differences are given, calculated from the maximum ratio in each series.

These tables show the results in series, decreasing from the maximum value in each case. In the series relating to incidence a comparison of the actual with the probable differences shows that there is a valid distinction between the members of the series; that, in fact, the incidence is greatest in India and least in Mauritius (in which it is but 57·7 per cent. of the Indian rate), and that the stations probably fall in something like the order shown—that is, the greatest difference in incidence is between the two stations which have the worst climates and the most severe endemic disease. Otherwise, the series bears some general relation to the climatic and disease conditions prevailing at each station.

Comparing the differences in the mortality table, one finds that only two stations stand out as essentially different from the others in their mortality rates: these are Gibraltar and South Africa, where the mortality is distinctly less than in any of the others. The remaining stations show no significant difference between the death rates.

Turning to the total loss, the rates in the United Kingdom, Malta, and Ceylon are not distinguishable, and are in excess of the remainder. The other stations differ among themselves, except possibly Bermuda and Mauritius, but the maximum difference is unimportant (about 16 per cent.).

TABLE I.—INCIDENCE OF TUBERCULOSIS IN BRITISH ARMY PER 1,000 OF STRENGTH.

Station.	Ratio per 1,000.	Probable Difference.	Actual Difference.
India	3·71	—	—
United Kingdom	3·23	0·15	0·48
Ceylon	2·90	0·29	0·81
Malta	2·63	0·16	1·08
South Africa	2·49	0·19	1·22
Gibraltar	2·32	0·19	1·39
Bermuda	2·27	0·28	1·44
Canada	2·24	0·23	1·47
Mauritius	2·14	0·30	1·57

TABLE II.—MORTALITY FROM TUBERCULOSIS IN BRITISH ARMY PER 1,000 OF STRENGTH.

Station.	Ratio per 1,000.	Probable Difference.	Actual Difference.
Malta	0·777	—	—
India	0·773	0·06	0·004
United Kingdom	0·725	0·06	0·052
Bermuda	0·692	0·13	0·085
Ceylon	0·658	0·13	0·119
Canada	0·656	0·13	0·121
Gibraltar	0·563	0·07	0·214
Mauritius	0·528	0·16	0·249
South Africa	0·506	0·08	0·271

TABLE III.—TOTAL LOSS FROM TUBERCULOSIS IN BRITISH ARMY.

Station.	Ratio per 1,000.	Probable Difference.	Actual Difference.
United Kingdom	2·41	—	—
Malta	2·21	0·12	0·20
Ceylon	2·09	0·26	0·32
India	1·90	0·09	0·51
Gibraltar	1·89	0·07	0·52
Canada	1·85	0·18	0·56
Bermuda	1·76	0·23	0·65
Mauritius	1·74	0·28	0·67
South Africa	1·59	0·14	0·82

(No difference can be taken to be significant which is less than about three times the probable difference.)

The United Kingdom is not strictly comparable with the other stations, in that here cases come on record which do not elsewhere—that is, cases occurring in the very early period of service after enlistment, without any service abroad, and also those cases which really are to be credited to a foreign station, but which have managed to escape admission to hospital there, but break down on return to this country. Neither class is, perhaps, very numerous, but not entirely negligible. Again, four of the small stations—Canada, Bermuda, Ceylon, and Mauritius—show an extreme variation in the annual rates. This is taken account of in the probable difference, but one has to remember that the occurrence at these stations is very irregular.

Now, the maximum difference in the rates is not very great: it is greatest in the incidence—about 42 per cent.—and about 34 per cent. in the mortality and total loss rates. This is widely different from the differences in such diseases as enteric and malarial fevers, is considerably less than in dysentery, and rather less than in the group of diseases of the digestive system. So that the climatic and other influences are less important than in any of these diseases.

Mauritius is exceptional in position; with a climate that is worse than that of most parts of India, and a high degree of prevalence of a severe type of malaria, it gives almost the best results in the series. Why this is so is not at all evident, but in relation to other diseases also Mauritius usually occupies an exceptional place.

The following *general conclusions* appear justifiable:

1. The influence of the aggregate of the local conditions on the development of tuberculous disease is in no case very marked.

2. What influence there is appears to be exerted on the development of the disease—*i.e.*, infection and early reaction—rather than on its course.

3. As regards development, if one excludes the United Kingdom and Mauritius, both exceptional in some way, there is a general relation between the local conditions and the degree of prevalence—that is, the more trying the climate and the more prevalent other diseases, the higher the incidence of tuberculosis.

4. As regards the course of the disease, South Africa confirms its reputation by showing the best results both in relation to acuteness and severity. Gibraltar also seems to be little favourable to rapid development. As regards the other stations, the differences shown are not sufficient to permit of any distinction between the mortality rates, and the rates for total loss are hardly suitable for close comparison. Hence, one must for the present be content to say that there is no evidence of any important difference.

A closer examination of the differences between the individual stations would necessitate a detailed examination of all the local con-

ditions—an inquiry possibly promising, but requiring much time for its prosecution and much space for its results.

One would expect to find that influences tending to depreciate the general vital resistance would be favourable to the development of tubercular infection, and it is a little surprising to find that the general effect is apparently so slight even on incidence, while as regards the course of the disease these local influences appear to be of still less importance.

TUBERCULOSIS IN THE INDIAN ARMY:

Its Incidence as affected by Locality, Racial Proclivity, and Service Generally.

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"It is unanimously agreed by all medical authorities that tuberculosis in native children in India is rare in any form, either as tabes mesenterica, strumous glands, or tubercular hip disease. Pulmonary phthisis is, on the other hand, very common in India among adults. Birch says that 'Eurasians are affected more than any other class; next to them lower-class Mohammedans. Among well-to-do Hindus it is certainly not so common.'" This statement must be modified, and does not hold good at the present time, for, in my opinion, and as will be shown in this paper, tuberculosis is on the increase among the native population in India—at any rate, among the adults. No conclusive deductions can be made as regards the incidence of tuberculosis generally among the civil population of India, as statistics furnished by provincial Governments do not admit of any comparison being made between the prevalence of the disease in the civil population and the native troops in India and European countries; but from the Annual Reports of the Sanitary Commissioner for the Government of India precise figures and comparisons can be made regarding the armies and jails in India. At the outset it may be stated that tuberculosis is only met with in one form in the Indian army, and that is *phthisis pulmonalis*. It is possible that the final stages of some of these cases *do* result in general tuberculosis, but it is not so met with in the Indian army as a rule, as the cases are invalided out of the service before the final stages of the disease are reached, and they then drift to civil hospitals or die in their own villages. I give here a return showing admissions for tuberculosis of the lungs for the last twenty years as it occurred in the European and native troops in India as a whole.

TABLE I.—ADMISSIONS TO HOSPITAL FOR PULMONARY TUBERCULOSIS.
(*Ratios per Mille.*)

Year.	European Troops.	Native Troops.	Year.	European Troops.	Native Troops.
1885 ...	6·4	2·6	1896 ...	5·0	2·5
1886 ...	5·9	2·6	1897 ...	4·2	2·6
1887 ...	4·8	2·5	1898 ...	3·0	3·5
1888 ...	4·2	2·3	1899 ...	3·1	3·3
1889 ...	4·2	2·1	1900 ...	3·4	3·7
1890 ...	4·2	2·6	1901 ...	3·4	4·2
1891 ...	3·2	1·7	1902 ...	3·4	4·3
1892 ...	3·0	1·7	1903 ...	—	—
1893 ...	3·0	1·6	1904 ...	2·8	3·9
1894 ...	3·1	1·4	1905 ...	2·1	3·1
1895 ...	4·8	2·3			

It will be seen that for the period 1885 to 1897 the ratio of admissions for the British army was always higher than the Indian army; but from 1898 to the last year under review the figures have been reversed, the Indian army showing a higher ratio than the British.

The figures also show that tuberculosis in the British army has been decreasing greatly since 1885, whereas the same disease in the Indian army has been gradually on the increase for the same period (although the return for the last year under review is somewhat better than the previous year). Taking the two armies as a whole, one would naturally ask for the cause of this strange increase in one case compared with the decrease in the other army, both serving in the same country. My views on the subject can be gathered from the subsequent statements regarding accommodation, for whereas the barracks and living generally of the British army have been greatly improved within the last decade, the improvements on these lines for the native army (although there have been some) have not kept pace with those in the British army. But this explanation alone cannot account for the individual increase in the ratios for the Indian army from 1885 to 1905, although it might account for stability or slight decrease of the ratio for the same period. Therefore, further reasons for this individual increase must be sought for, and the only explanations that are offered (for this individual increase) are that it is due in a measure to, *firstly*, better clinical means of diagnosis in the recent years, whereby more cases of tuberculosis are diagnosed and returned as such. In former years many cases were returned as chronic lung complaints, and not tuberculosis (no verification of diagnosis as a rule can be produced, as it is exceedingly difficult to obtain post-mortem examinations in the native army). *Secondly*, a greater number of Gurkha

regiments have been formed in recent years (and the Gurkha, as will be shown later, is very susceptible to the disease), thereby introducing a more susceptible element, that would tend to increase the ratio. *Thirdly*, and lastly, it seems evident that tuberculosis is on the increase now among the native population generally.

Tuberculosis among Native Soldiers and Prisoners.

The incidence of tuberculosis in the Indian army with that of the jails of India is seen in the attached tabular statement for each quinquennium:

TABLE II.—PREVALENCE OF PULMONARY TUBERCULOSIS AMONG NATIVE SOLDIERS AND PRISONERS.

(*Ratios per Mille.*) *a* = *admissions.* *d* = *deaths.*

Year.	Indian Army (Native Troops).		Prisoners in Jails.
1886	*a*	3·0	5·0
	d	0·69	2·45
1891	*a*	1·7	2·6
	d	0·42	1·17
1896	*a*	2·5	7·3
	d	0·65	2·99
1901	*a*	4·2	8·6
	d	0·84	3·54
1904	*a*	3·9	8·4
	d	0·51	3·09
1905	*a*	3·1	8·7
	d	0·5	3·19

The morbidity of the disease in the Indian army, as will be seen, is very much less than among prisoners in jails, and the death ratios in the Indian army are apparently much less than in the jails, but this is accounted for by the sepoys being invalided out of the service before death overtakes the individual, whereas in the jails a greater proportion of them die before their term of imprisonment is over. The ratios of recoveries are not necessarily greater in the Indian army than in the jails. After working out the figures for a series of years, it is interesting to note the relative liability in percentages to tuberculosis in the European troops, native troops, and jails of India consecutively. This is brought out in the next table:

TABLE III.—RELATIVE LIABILITY TO PULMONARY TUBERCULOSIS.

(*Expressed in Percentages.*)

European Troops.	Native Troops.	Prisoners in Jails (excluding Andamans).
10	15	75

Incidence of Pulmonary Tuberculosis in Different Presidencies.

The incidence of pulmonary tuberculosis in soldiers and prisoners in jails as affected by the presidencies can be studied from the following tabular statement of each quinquennium:

TABLE IV.—INCIDENCE OF PULMONARY TUBERCULOSIS IN DIFFERENT PRESIDENCIES. (*Ratios per Mille.*)

Year.	Native Troops.			Jails.		
	Bengal.	Madras.	Bombay.	Bengal.	Madras.	Bombay.
1886 ...	3·4	2·6	2·1	5·0	6·0	3·0
1891 ...	2·8	0·4	0·7	3·2	2·5	1·7
1896 ...	3·5	1·6	1·5	7·3	7·7	9·9
1901 ...	5·5	1·7	3·5	8·9	12·0	9·3
1905 ...	4·1	1·2	2·4	10·0	10·8	8·3

The army of Madras shows throughout the smallest ratios of incidence and mortality and Bengal the highest, the only exception being in 1886, when Madras recorded a higher ratio than Bombay; but it must be noted that during this year six regiments of Madras troops were on active service in Burma, and some were also at Suakin, so a good many regiments of Madras troops were not serving in their presidency during this year. Although the Madras regiments show such a low record compared with other armies, yet the Madras jails, by a strange coincidence, show a higher ratio generally than the other presidency jails, and the Bengal jails in the recent years give the lowest ratio, whereas the native troops in Bengal show the highest ratio. These comparative statements, therefore, do not *apparently* admit of any conclusion being come to regarding the incidence of the disease as affected by the presidencies.

The Influence of Climate.

"No law can be pointed out as indicative of the influence of the climate on the prevalence of tubercle of the lungs in India." Such was the opinion expressed by Lieutenant-Colonel A. Crombie, late of the Indian Medical Service, and his arguments were based on the following reasons: "From statistics furnished by the figures for the year 1896, among European troops the highest rate of admissions was in the Deccan (7·7 per 1,000), and lowest in the West Coast regions (0·6). Among native troops it was highest in the hill stations (3·7), and lowest

in Southern India (0·9). Among prisoners it was highest in Southern India (15·1), and lowest in inland Burma (1·2 per 1,000). In other years the figures have been entirely different." Since his statement was made the figures remain in the same relative proportion, with the exception of the admission-rate for the Deccan, which shows a very small percentage at the present day. The chief climatic conditions of India, as indicated under such headings as rainfall, humidity, sunshine, and temperature, are graphically portrayed in the accompanying map.

TABLE V.—ANNUAL AVERAGE RAINFALL (INDIA).

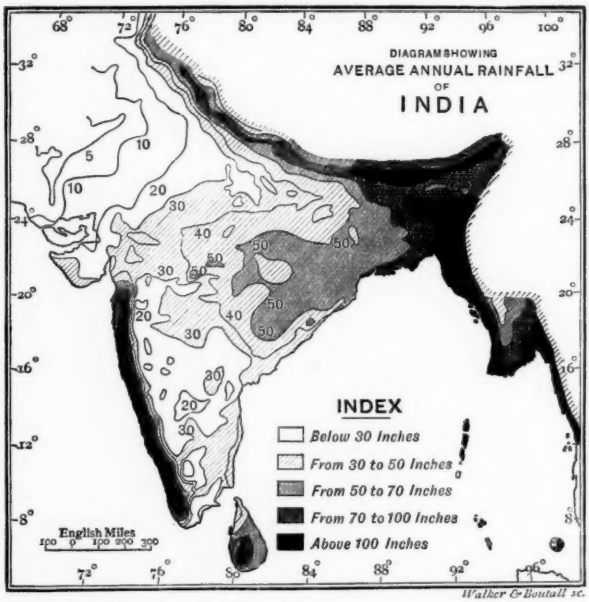

DIAGRAM INDICATING AVERAGE ANNUAL RAINFALL IN INDIA.[1]

As regards the *rainfall*, it will be seen that the highest rainfall occurs in the following areas: Tenasserin, Konkhan Ghats (Bombay), Malabar Ghats (West Coast of Madras), Assam, and Cachar. These have an average rainfall of over 100 inches. The lowest rainfall is in the Sindh and Kutch districts, and the next lowest the Punjab plains, Bellary, and Deccan.

As to *humidity*, the following table shows the mean annual humidity

[1] Reproduced from "Practical Guide to the Climates and Weather of India, Ceylon, and Burmah, and the Storms of the Indian Seas," by H. F. Blanford, by the courtesy of the publishers, Messrs. Macmillan and Co.

for several provinces, and it will be noted that the areas of humidity agree with the areas of rainfall.

TABLE VI.—INDICATING MEAN ANNUAL HUMIDITY IN DIFFERENT DISTRICTS OF INDIA.

North-West Himalaya (lower ranges)	...	...	62
Nepal	...	...	72
Sindh and Kutch	...	...	50
Punjab plains	...	...	55
Rajputana	...	...	48
Central India Plateau	...		50
North-West Provinces and Oudh	...	...	59
Behar	...	...	65
Bengal	...	...	80
Assam	...	...	80
Chota Nagpur	...	...	57
Deccan	...	...	55
Hyderabad and Bellary	...		54
North Circars and Godavery			71
Carnatic	...	...	67
Mysore	...	...	66
Malabar and Coorg	...	...	79
Ceylon	...	...	80
Pegu	...	...	80

Sunshine.—According to Mr. H. F. Blanford,[1] Madras and Southern India have the least amount of sunshine in the year, and the greatest amount is met with in Allahabad, Central and North-West India.

Temperature.—The mean highest is met with at Jacobabad, Deccan, Sialkot, Agra, Peshawar, North-West Rajaputana generally, then Central Provinces, Secunderabad, Karachi, Madras (East and South), and Calcutta. The mean lowest temperature is met with at Leh (−4° F.), Quetta, Simla, Darjiling, Pindi, Peshawar, and Sialkot.

From the above statements we find that the greatest rainfall and relative humidity are in the West Coast of India (where the number of Madras troops stationed are few), the West Coast of Burma, Assam, Lower Bengal, the Himalaya ranges, and Nepal—in these last four areas the Gurkha regiments are stationed. The climate of India varies considerably in the different quarters of Hindustan, and we find the highest rainfall and relative humidity occur in the very areas where the highest ratio returns for tuberculosis occur in the native troops. Thus, Eastern Bengal and Assam have a very high relative humidity, and the troops stationed there show the highest return for tubercle; so do the Himalaya ranges, Konkhan Ghats, and the West Coast of India. In the last place—Malabar coast of Madras—only two regiments in former years (now only one) were stationed—viz., at Quilon (which now no longer exists as a military station) and Cannanore, and the regiments that were stationed at these towns show a higher ratio generally than the other regiments in the Madras Presidency. By referring to the following table, which shows the incidence of tuberculosis "by geographical areas," we will have a further opportunity of seeing what effect climate is capable of producing on the incidence of this disease.

[1] "Practical Guide to the Climates and Weather of India, Ceylon, and Burmah, and the Storms of the Indian Seas." By H. F. Blanford. London: Macmillan and Co. 1889. Price 12s. 6d.

TABLE VII.—INDICATING PREVALENCE OF PULMONARY TUBERCULOSIS ACCORDING TO GEOGRAPHICAL AREAS.

(*Average Ratio per Mille for the Years* 1891 *to* 1905.)

Areas.	Native Troops.	Jails.
1. Burma, coast	1·9	6·6
2. Burma, inland	2·3	8·0
3. Assam	5·2	2·8
4. Bengal and Orissa	3·3	10·2
5. Gangetic Plain and Chota Nagpur	3·8	6·6
6. Upper Sub-Himalaya	5·5	6·1
7. North-West Provinces and North-West Rajputana	5·2	5·1
8. Central India and South-East Rajputana	3·0	6·8
9. Deccan	1·5	3·2
10. West Coast	2·2	9·0
11. South India	1·76	10·0
12. Hill stations	6·1	2·5
All India	3·6	6·7

Pulmonary Tuberculosis and Geographical Areas of India.

Hill Stations.—The troops suffer far more in hill stations than the prisoners. This fact is due to the Gurkha regiments, which are the most susceptible, being stationed in the hills; but it is to be noted that the admission-rates for the Gurkhas in the Assam hills for the year 1905 (under the head of geographical area—Assam) fell very considerably, and gave the return 1·1 per mille, the previous year being 7·5 per mille; Assam jails returned 3·6 per mille for the same year. This diminution of the ratio for the troops was due to the number of Gurkhas in the Assam district being reduced.

Deccan.—The Deccan is possibly the healthiest geographical area *now* for troops and prisoners in all India, and their returns generally remain steady and small, prisoners returning twice as many as troops.

West Coast of India.—This area is apparently healthy for troops, although it has to be qualified by the fact that very few troops are stationed on the West Coast; prisoners, on the other hand, show a heavy return for this area, and the jail figures are apparently on the increase. This is accounted for by the small jails of the West Coast having been enlarged and converted into large central jails during the last few years.

South India.—In this area Madras troops return a steady and small

ratio, whereas the jails return a very high ratio, the cause of which is said to be due to the excessive overcrowding in the Madras jails, which probably is the factor for giving this very high ratio. It is only within the most recent years that the Madras jails have given such a high ratio, one cause for which is an influx of Burmese convicts, this race being very prone to the disease.

Housing and Clothing.

Government clothing is issued to all the troops, and is generally suited and adapted for the various climates. As regards the housing and accommodation, I think there is much to be desired. The Indian army was originally given a grant for the purpose of building its own hutting lines, which the individual regiments themselves keep up by means of a hutting allowance, taking steps gradually to repay Government the original grant. I believe now it is the intention of Government to take over all the hutting lines, and legislate for their proper upkeep by the Military Works Department; and if the hutting lines are all reconstructed on an up-to-date sanitary plan, there ought certainly to be a reduction in the incidence of some of the diseases, especially so of tuberculosis. As they exist at present the hutting arrangements in the native army do not meet with the necessary modern sanitary requirements, all being defective in some way, either in ventilation, floor-space, or overcrowding, especially so in the married quarters; but some lines are better than others. To meet the defects a standard plan of barrack accommodation for the bachelors, and properly designed quarters (limited in number) for the married men, ought to be laid down and given effect to, after which, I have no doubt, we will find that the incidence of tuberculosis in the native army will diminish in ratio in the same manner as it has done in recent years in the British army (*vide* Table I. and the preamble attached thereto). Till such time as this improvement in the hutting lines can be carried out the following recommendations are suggested. Every case of tuberculosis in the regimental lines ought to be segregated, pending invaliding, and the hut that contained the case ought to be thoroughly disinfected. This can very easily be done as regards bachelor sepoys themselves, but when it involves the married men, especially Mohammedans, with their purdah women, we are met with an Oriental obstacle that is hard to overcome; and the only practical way of overcoming this difficulty is to invalid the husband (the sepoy) out of the service, whether it is he himself or one of his family who has the disease. This seems rather a sweeping recommendation to make, but if the order was that the affected female only must leave the lines, this would either entail hiding the cases and no notification; or, if notified by the husband or his non-commissioned officer and the order given effect to, the female would be sent out of the lines, and, under strict discipline,

back to her village, and in the ordinary course of the man's service he would get furlough to the same village and house, and would be exposed to the same infection, and probably under worse conditions; thus he would be just as likely to contract the disease while on furlough and bring it back to the regiment with him. Thus, the source of contagion to the regiment would be only "once removed" from the original source. I think the above argument is strong enough to justify the advice being given to invalid the married sepoy from the service in the event of his wife or family developing the disease, or at least to remove him to the reserve.

Racial Proclivity.

What effect racial conditions have in the Indian army on the incidence of tuberculosis can be gathered from studying the subjoined table. In this table I have grouped together the different caste regiments, with their ratio returns of phthisis pulmonalis for the years 1886 to 1899, extracted from the Annual Return of the Sanitary Commission for the Government of India. (I have no other data at my disposal to go on beyond these years.)

TABLE VIII.—INCIDENCE OF PULMONARY TUBERCULOSIS IN CASTE REGIMENTS. YEARS 1886-1899.

GURKHAS. (*Ratio per Mille*, 7·3.)

Regiments.	Total Strength.	Total Admissions.
1st Battalion 1st Gurkhas	10,380	146
2nd ,, ,, ...	10,495	105
1st Battalion 2nd Gurkhas	10,482	144
2nd ,, ,, ...	10,190	103
3rd Gurkhas	10,746	32
1st Battalion 4th Gurkhas	10,401	82
2nd ,, ,, ...	10,301	79
1st Battalion 5th Gurkhas	10,617	60
2nd ,, ,, ...	8,615	50
6th Gurkhas	10,676	84
2nd Battalion 8th Gurkhas	11,205	51
1st ,, ,, ...	11,229	31
9th Gurkhas	8,973	32
10th Gurkhas (1890-1899)	6,542	29
Totals	140,852	1,028

RAJPUTANA RAJPUTS. (*Ratio per Mille*, 6·63.)

Regiments.	Total Strength.	Total Admissions.
13th Rajputs	10,254	68

TABLE VIII.—INCIDENCE OF PULMONARY TUBERCULOSIS IN CASTE REGIMENTS. YEARS 1886-1899—*continued.*

DOGRAS. (*Ratio per Mille*, 5·94.)

Regiments.	Total Strength.	Total Admissions.
37th Dogras	9,330	59
38th Dogras	8,518	45
Totals	17,848	104

JATS. (*Ratio per Mille*, 3·7.)

Regiments.	Total Strength.	Total Admissions.
6th Jat Light Infantry ...	9,202	54
10th Jats	10,562	40
12th Pioneers (one-half Jats, one-half Sikhs) ...	5,104	16
14th Murray's Jat Lancers	7,038	9
Totals	31,906	119

HINDUSTANI MUSSULMANS. (*Ratio per Mille*, 3·45.)

Regiments.	Total Strength.	Total Admissions.
1st Lancers	7,533	18
5th Light Infantry ...	10,450	46
17th Infantry	10,263	17
18th Infantry	10,852	54
Totals	39,098	135

HINDUSTANI RAJPUTS. (*Ratio per Mille*, 2·75.)

Regiments.	Total Strength.	Total Admissions.
2nd Rajput Light Infantry	10,664	24
4th Rajputs	10,728	22
7th ,, ...	10,799	19
8th ,, ...	10,950	60
11th ,, ...	10,609	20
16th ,, ...	10,101	31
Totals	63,851	176

SIKHS. (*Ratio per Mille*, 1·78.)

Regiments.	Total Strength.	Total Admissions.
14th (Ferozepore) Sikhs	10,337	13
15th (Ludiana) Sikhs...	9,368	19
23rd Sikh Pioneers (Mazbi Sikhs) ...	10,433	13
32nd Pioneers (Mazbi Sikhs)	10,655	24
34th Sikh Pioneers (Mazbi Sikhs) ...	8,122	14
35th Sikhs (Jat Sikhs)	9,042	6
36th Sikhs (Jat Sikhs)...	8,962	20
45th Rattray's Sikhs ...	9,381	28
Totals	76,300	137

"OTHER CASTE" PARIAHS. (*Ratio per Mille*, 1·9.)

Regiment.	Total Strength.	Total Admissions.
2nd Queen's Own Sappers and Miners	14,427	25

TABLE VIII.—INCIDENCE OF PULMONARY TUBERCULOSIS IN CASTE REGIMENTS. YEARS 1886-1899—*continued.*

BRAHMINS. (*Ratio per Mille*, 1·6.)			GHARVALLIS. (*Ratio per Mille*, 1·36.)		
Regiments.	Total Strength.	Total Admissions.	Regiment.	Total Strength.	Total Admissions.
1st Brahmins	9,388	13	39th Garhwal Rifles ...	8,054	11
3rd ,, ...	10,834	20			
Totals	20,222	33			

PATHANS AND PUNJABI MUSSULMANS. (*Ratio per Mille*, 1·7.)			MAHARATTAS (*Ratio per Mille*, 1·5.)		
Regiments.	Total Strength.	Total Admissions.	Regiments.	Total Strength.	Total Admissions.
15th Lancers	7,187	11	105th Bombay Infantry	9,959	22
17th Cavalry	7,352	7	110th ,, ,,	10,146	10
18th Bengal Lancers (one-fourth Sikhs) ...	5,088	11	114th ,, ,,	9,234	21
19th Punjabis (one-half Sikhs)	5,126	7	116th ,, ,,	8,977	7
22nd Punjabis (one-half Sikhs)	4,853	11	117th ,, ,,	10,086	20
33rd Punjabis (one-fourth Sikhs) ...	7,126	17	121st ,, ,,	10,435	23
40th Pathans (one-fourth Dogras) ...	7,430	15			
Totals	44,362	79	Totals	58,837	93

The races most subject to pulmonary tuberculosis can be arranged in the following order:

Gurkhas	7·3	Other caste men (Pariahs)	1·9[2]
Rajputana Rajputs ...	6·63	Sikhs	1·78
Dogras	5·94	Punjabi Mussulmans ...	1·7
Jats	3·7	Brahmins	1·6
Hindustani Mussulmans ...	3·45	Maharattas...	1·5
Hindustani Rajputs ...	2·75	Madrassis	—

HINDU RACES.

If I was to parade in line a representative of each of the castes of India, and ask any physician to select the best physique, and the one

[1] All these regiments have two companies of Dekani Mohammedans.
[2] This return must be considered as doubtful.

least liable to contract pulmonary tuberculosis, I feel sure he would select the Gurkha, for he is a veritable pocket Hercules, and probably the Madrassi as most likely to fall victim. On looking at the accompanying table, one is surprised to find this selection does not bear out the looked-for results—the Gurkha has suffered most and the Madrassi least from tuberculosis.

The following habits are common to all the Hindu races: They never eat beef under any circumstances, but mostly goat flesh, and it is known that the goat is most refractory to tuberculosis. On this ground the Hindus should show a smaller liability to the disease than the Mohammedans (who are beef-eaters), but the returns given do not bear this out, for the Hindus seem to suffer more than the Mohammedans. All the Hindus do not seem liable to the same degree, the difference being apparently due to some other individual factor, such as individual racial habits, etc. Every native of India drinks milk, but this vehicle of contagion cannot be taken into account, as the natives, as a rule, drink the milk after boiling it, chiefly on account of economy, as the milk does not keep fresh very long in the East. Bovine tuberculosis in India is uncommon, according to Professor Simpson, of Calcutta, but I think this statement must be modified nowadays. In the place I am at present stationed in, tuberculosis is rife among the families of beef butchers.

Brahmins.—These high-class Hindus are supposed to be the cleanest race in India; they are pure vegetarians, and never eat meat of any kind, and they do not indulge in tobacco or alcohol; as a result of these qualifications, they apparently show the least liability to tuberculosis. Their susceptibility is certainly small.

The *Gurkhas*, on the other hand, have just the opposite qualifications, being great meat-eaters, and their habits are far from cleanly; the result is they suffer from tuberculosis more than any other race in India. Some medical officers in charge of Gurkha corps say that the Gurkha has a greater hereditary predisposition to tuberculosis than any other race, and their susceptibility is partly hereditary and partly acquired, the latter being due to absence of domestic cleanliness and to defective ventilation in their barracks and quarters. These partly acquired reasons can be understood if one remembers that the Gurkha resides during most of his service in the hills, where the climate is very cold (damp and humid), and he is apt to block up most of his ventilation to produce a degree of warmth. It is stated that the disease is more prevalent among the married Gurkhas than the bachelors.

Dogras.—These are mainly hill Hindus inhabiting the lower ranges of the Himalayas, and as a race they show a great proclivity to the disease—in the table of figures they stand third highest as regards susceptibility; they are not usually said to be specially dirty in their

habits, so the individual factor for this liability must be due to their being hill-men from the Lower Himalayas, suffering frequently from lung complaints, with a distinct racial susceptibility, and they have the usual failing of keeping out ventilation from their dwellings during the colder months.

Rajputs.—This race really embraces a large number of sects, which are returned as Hindus, but some of the race adopted the Mohammedan faith, thus becoming Mussulman Rajputs, and yet they are all supposed to be descended from a Hindu King, or Raja, so adhere to their Raja origin by calling themselves Rajputs, whether they are really Hindu or Mussulman. But what is generally understood now by Rajputs is the Hindu race of Rajputs, and these are again divided into those coming from Rajputana and those from the rest of Hindustan. Strange to say, this last distinction seems to have a distinct bearing on the incidence of tuberculosis among them, for the Rajputana Rajputs appear to be very susceptible to the disease. The 13th Bengal Infantry is the only regiment that is purely a Rajputana Rajput regiment, and their ratio return for the period 1885-1899 is absurdly high—in fact, second highest on the scale—whereas the other Hindustan Rajputs show a very small ratio. On searching for an individual factor as an explanation for this high ratio among Rajputana Rajputs, I can come to no conclusion beyond that the race is highly susceptible to the tuberculous disease; the climate of their district is very dry (relative humidity lowest in India), geographical area a vast sandy plain, plenty of sunshine and small rainfall, but they have extremes of heat and cold. Beyond this I can offer no explanation why they should suffer so much from tuberculosis.

Sikhs.—The Sikh caste seems to be a hardy race as regards tuberculosis, and, although their habits are not too cleanly, and though they are, in addition, great eaters of pork (a flesh particularly liable to tuberculosis), their ratio return for the disease is very small; hence we can conclude that their susceptibility to the disease is exceedingly small, for they apparently give themselves just as many chances for developing the disease as the other races of the North. But it must be mentioned they are not betel-leaf or tobacco chewers and do not smoke, although they indulge in alcoholic beverages.

Garhwalis.—This race of Hindus from the district round Bareilly is somewhat similar to the Gurkha, but are a taller race of men, and not unlike the Dogra. There is only one regiment of them—a second battalion has just been raised—and the ratio return for this regiment is small. Although they are hill-men, and practically subservient to the same drawbacks as Gurkhas, their susceptibility must be considered as being small.

Jats.—This race of Hindus are essentially agriculturists; their

district borders on Rajputana on the one hand, and the Dogra district on the other, and their position in the racial scale as regards liability to tuberculosis is next to the Dogras. They indulge freely in all kinds of meat except beef, and are addicted to alcoholic liquor, and often indulge freely in unboiled milk; their habits are not very cleanly, and their susceptibility to the disease is derived apparently from their Rajputana ancestors.

Mahrattas.—This caste is mostly found in Hyderabad, the Deccan State, and the country west of it towards Bombay. They are generally cleanly in their habits, and usually conform to strict Hindu habits. Their geographical area is greatly composed of a dry, arid district, where the rainfall and humidity are small (excepting the hilly range), and their liability to the disease naturally appears small.

Madras Hindus and "Other Caste" Hindus.—This sect really consists of the Tamils and Telegus of Madras, and also a lower-caste community returned as "other caste" officially, but called generally Pariahs. The Tamils and Telegus usually eat all kinds of meat (except beef and pork), and indulge in alcohol (native liquor) freely. Most of the Madras regiments (except Burma battalions) have half their strength composed of Madras Hindus, and as the return ratios for Madras regiments are the smallest of all armies, it is only natural to suppose that the Madras Hindu is not very susceptible to the disease; but the Madras Sappers and Miners show a very high ratio return compared with the rest of the Madras army. Their average ratio return for the years 1885–1899 is 1·9 per mille compared with the rest of the Madras army, which is 1·47 per mille. The individual factor in this case is due to very many men of the lower-caste Hindus ("other caste") being present in the regiment whose personal habits are not of the best. But it must be noted that one company of the Sappers is composed of Burmans (a race very liable to the disease), and one of the companies is always serving out of their own presidency in the furthest North of India—Chitral, etc.—and these two companies will always tend to increase the ratio return of the Madras Sappers and Miners.

The Mohammedan Races.

The Mohammedan races can be studied under three divisions—the Punjabi Mussulmans and Pathans, Hindustani Mussulmans, and the Mussulmans of the Deccan and South India. The habits of the Mohammedan race generally are more cleanly, and they are generally a more hardy race than the Hindus. They are all meat-eaters, including beef, but alcoholic beverages are not indulged in by them. Their position in the racial proclivity scale is, in the case of the Deccani Mohammedans, lowest of all, but the Hindustani Mohammedan inhabiting the Gangetic and sub-Himalayan districts appears to be more

liable to the disease than his other brethren in the race, the individual factor in their case being, I think, due to the geographical area they live in, for, given a certain degree of susceptibility, the climate, rainfall, and humidity of this area would predispose them to the development of tuberculosis.

Chewing, Expectorating, and Tuberculosis.

A general habit that exists throughout India (except in the Khalsa race, Sikhs) is the habit of chewing betel-leaf; this gives rise to that loathsome habit, "spitting," which is now recognized by all Western countries as a great factor in the spread of tuberculosis. If it were not for the actinic and heating rays of the sun being amplified in this country, there is no doubt that this habit of expectorating would tend to cause a greater spread of the infection of tuberculosis than it does, and one is apt to seek this as a cause of the increase of tuberculosis in those regions where the sun does not exert its powerful rays all the year round—*e.g.*, the hilly ranges of Northern India and Assam (the sub-tropical region)—for it is from the class of men that inhabit these regions that we get the heaviest ratio return of tuberculosis, and the habit of betel and tobacco chewing is indulged in more freely in these regions than further south. In Southern India the women chew the betel-leaf more than the men; and in support of this argument, the only race that do not indulge in this habit are the Sikh race, and they are seen to be less liable to the disease than the others. On the other hand, the jails of Southern India show a higher ratio than those in the North, and in neither of these regions are the convicts allowed to indulge in this habit; so this is apparently an argument against taking this habit into consideration when studying the cause of the incidence of tuberculosis; but I think it would be a legitimate counter-argument to say that as the chewing habit is not indulged in by either of these territorial jails, therefore no comparison can be drawn on this point, and it could only be compared if the chewing habit was not indulged in by the prisoners in Madras and was indulged in by those in the Northern jails.

In conclusion, we can safely assert that tuberculosis in the Indian army is most prevalent among those races which inhabit the sub-tropical regions, more especially in the hill ranges, and is least prevalent in the *tropical regions* (torrid zone), and diminishes progressively the nearer the equator is reached. Climate and race combined seem to have a distinct bearing on the incidence of tuberculosis—at any rate in the Indian army.

My thanks are due to First Class Hospital Assistant Syed Abdul Lateef for his valuable assistance in compiling the statistical figures, and to Major F. Jollie, I.A., of my regiment, for help in type-writing.

TUBERCULOSIS IN THE EGYPTIAN ARMY.

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THE Egyptian Army is a force of about 16,000 men, composed of Egyptians and Sudanese, the former recruited by conscription, the latter raised by voluntary enlistment amongst the inhabitants of the Sudan. There is also an Arab battalion recruited in Kassala District, and a Sudanese Camel Corps formed chiefly from the Arabs of Kordofan Province. This force forms the garrisons of widely scattered posts throughout the Sudan, and of certain Egyptian stations. Egyptians and Sudanese are kept apart by being posted to separate battalions, in view of differences in racial customs and preferences; so that the Egyptian Army forms two communities, which, differing in geographical and racial origin, differ also in their liability to the diseases of the country. The Egyptian brings to the army his local ailments, especially bilharzia and ankylostoma; and a terrible liability to malarial diseases. The Sudanese is, on the whole, a healthier person; but has a special susceptibility to chest complaints, especially when serving in the more northern and colder stations, such as Cairo.

General Considerations.

Tuberculosis, as a disease of the country, has not received as much attention as it deserves. The interest of medical officers is naturally deflected from a complaint, with which they are only too familiar at home, by contact with the less known and more engrossing maladies of a tropical climate. It is hard to find any local literature on the subject. There is a short but highly interesting paper dealing with "Tubercle in Egypt," by Dr. P. C. Tribe, in vol. ii. of the records of Kasr-el-Ainey Medical School; and the presence of avian tubercle in the Sudan is noted in one of the Gordon College Reports; but I can find few other records. The chief interest of an inquiry into tubercle as affecting the Egyptian Army centres upon the alleged liability of the Sudanese to tubercle. On this point all the medical officers whom I have consulted are unanimous. It is the general opinion that the Blacks are more frequently and more severely attacked than the Egyptians. The possibility of the existence of a definite racial susceptibility raises a question of more than local or even military importance in connexion with tuberculosis; so much of this essay will be devoted to its discussion.

The conditions of service in the Egyptian Army differ largely, for-

the two communities already mentioned. They have in common an excellent ration, regular and healthy exercise provided by drills and "fatigues"; and improved house accommodation; as well as clothing and equipment closely resembling that of the British soldier serving abroad.

The differences are of greater importance, and must be discussed under separate headings.

Stations.—The Egyptian soldier, owing to his great liability to malaria, is not sent to stations south of Khartoum, except in the case of departments such as the "Medical" and "Works." The Sudanese are principally stationed on the Blue and White Niles, in the Bahr-el-Ghazal Provinces, and in Kordofan, as they are not very susceptible to malaria, and are thus under their natural climatic conditions.

Length of Service.—The Egyptian conscript serves for five years with the colours, and is recruited from the very flower of the manhood of Egypt, recruiting officers having the selection from amongst a very large number. The Sudanese makes the army a life-long profession, and only leaves it, as a rule, when considered too old to carry arms.

Marriage.—The Egyptian is obliged to live as a celibate during his five years of military service. The Sudanese is permitted to marry one wife; and accommodation is provided for the families, behind the barracks, in what are known as the Harimat lines. These soldiers are much less bound to barrack life than the Egyptians, a condition of things that has many advantages. The disadvantages of the system are exactly the points that have a bearing on the spread of tuberculosis. The soldier spends much of his time in a little hut, with, perhaps, a large family claiming its share of a limited air-space with a sparcity of doors and windows, and an earthen floor that contributes a generous supply of dust and other particulate matter to the air breathed by the occupants. Add to this that, while a sick soldier is at once sent to hospital, so that the Egyptian associates with healthy men in barracks, the life in the Harimat lines often involves living in the closest contact with the sick; as the women and children, in many cases, prefer not to go to the Civil Hospitals, which are generally available, sharing the suspicion with which uneducated natives still regard Government Institutions.

Food.—I have already quoted the ration as one of the features common to the Egyptians and the Sudanese. Though this is the case, there are some reservations to be made. The ration is drawn up to resemble as far as possible the food of the Fellaheen, and must, therefore, be thought specially suited to them. Further, the Sudanese, when married, draws his ration uncooked, and takes it off to the Harimat lines, where it is usually distributed amongst the family, and supplemented by meat and other articles purchased in the bazaars by

the lady of the house. The result of this is that the Black often gets actually less than his ration, and usually partakes of supplementary food which has not undergone the strict sanitary inspection to which the rations are subjected.

Alcohol.—Since the Fellah is a devout Mohammedan, the influence of alcohol is practically nil in Egyptian regiments and corps. The Sudanese, although he acquires Islam on joining his battalion, usually retains his pagan devotion to marissa, a kind of beer made from grain, the brewing of which forms a most important duty of the wives of the regiment. Alcohol, then, is probably a factor in the high incidence of tubercle amongst the Sudanese.

Age.—The Egyptian is usually conscripted at about eighteen years of age, with the result that he is generally out of the army before he is twenty-five. The Sudanese, being a "long-service" man, is still with the colours between the ages of twenty-five and thirty-five; the "vital period," during which the incidence of pulmonary tuberculosis is found to be the highest.

Conditions of service must always have a bearing on health, in so far as they contrast with home life. In the case of the Egyptian, on joining the army, he makes a change for the better in almost every respect.

The Sudanese tribesman lives under the conditions natural to primitive man, and enjoys health such as the wild animals only know. Any change towards civilization must be for the worse. Such a man when he has entered the army, although constantly guarded by excellent sanitary measures, will still be protected from disease by Art, instead by Nature, and Art is always imperfect.

Incidence of Tuberculosis.

From 1902 to 1906 there have been a total of 172 admissions for tuberculous diseases, or an average of 34·4 per annum out of an average strength of 15,606.

TABLE INDICATING INCIDENCE OF TUBERCULOUS DISEASE.

	Total Annual Average.	Tuberculous Annual Average.	Tuberculous per 1,000.
Strength	15,606	34·4	2·20
Admissions...	10,264	34·4	3·35
Invalids	276·4	12·6	45·5
Deaths	116·6	10	85·7

On examining these figures, which represent the influence of tubercle in causing admission to hospital, invaliding, and death in the

Egyptian army during five years, it will be seen at once that, while it accounts for a relatively small number of admissions, the invalid and death rates are very high.

It is interesting to compare the admission and death rates of tuberculosis with those of the other most fatal diseases of the Egyptian army.

TABLE INDICATING PREVALENCE OF TUBERCULOSIS AS COMPARED WITH OTHER DISEASES.

Diseases.	Admissions. Annual Average.	Deaths. Annual Average.	Deaths per 1,000 of Admissions (Case Mortality).
Malaria	1,343	14	10
Pneumonia	94	11	117
Dysentery	248	11	40
Tubercle	34·4	10	290

The case mortality is more than twice as high as that of any other disease, and the deaths from tuberculosis amount to 8½ per cent. per annum of all deaths in the Egyptian Army; while it must be remembered that all cases fit to go back to civil life are invalided early, with the exception of such as are curable by surgery, thus minimizing the mortality of tuberculosis in the army.

A table of the admissions for tuberculous diseases at the different stations occupied by troops shows that no large station is exempt.

TABLE INDICATING PREVALENCE OF TUBERCULOSIS IN DIFFERENT STATIONS IN EGYPT AND THE SUDAN.

Years.	Cairo District.			Northern Sudan.					Khartoum District.		Blue Nile District.		Kordofan District.		Kassala District.			White Nile District.			Bahr-el Ghazal District.			Total.
	Alexandria.	Cairo.	Assouan.	Halfa.	Dongola.	Berber.	Atbara.	Shendi.	Khartum.	Omdurman.	Wad Medani.	Rosares.	Obeid.	Taludi.	Kassala.	Gedarif.	Suakim.	Tanfikia.	Kodok.	Mongalla.	Wau.	Rumbek.	Tambura.	
1902 ...	—	3	1	5	1	3	—	—	1	1	—	1	—	—	8	—	—	1	3	—	—	—	—	28
1903 ...	—	9	—	6	1	—	—	—	5	4	1	—	7	—	2	—	—	—	—	1	—	—	—	36
1904 ...	—	11	—	5	—	—	—	1	4	4	3	1	4	—	6	1	1	—	1	2	—	—	—	44
1905 ...	3	9	—	1	—	—	—	—	9	—	1	—	2	—	2	—	—	—	—	2	3	—	1	33
1906 ...	—	9	1	—	—	—	1	—	4	1	4	—	1	2	1	—	—	2	1	1	2	1	—	31
	3	41	2	17	2	3	1	1	23	10	9	2	14	2	19	1	1	3	5	6	5	1	1	172

The strength of these posts has varied greatly throughout the five years dealt with, some, indeed, having ceased to be occupied, and others only having commenced to be stations during that time. As the number of cases has no significance when taken without considering the strength, a table has been prepared giving the incidence per 1,000 for each district, instead of for each station. The strengths used were those of a fairly typical year, as figures for five years are not now available; and the total strength so obtained was below the average for the year in question, so the "incidence" figures are a little too high. With this reservation they may be taken as a relatively accurate statement of the distribution of the disease throughout the army.

TABLE INDICATING PREVALENCE OF TUBERCULOSIS IN DIFFERENT EGYPTIAN AND SUDANESE STATIONS.

Station.	Strength of Troops.	Average Annual Tubercle.	Tubercle per 1,000.	Average Temperature.		Relative Humidity.	
				Max.	Min.	Winter.	Summer.
Cairo district	2,923	9·2	3·1	80	55	68·2	55·3
Northern Sudan ...	1,728	4·8	2·8	90	58	47·3	22·7
Suakim ...	1,138	0·2	0·17	98	75	76·0	36·5
Khartum district ...	2,995	6·6	2·2	96	68	36·5	33·4
Kassala ...	1,145	4·0	3·5	88	57	(?)	(?)
Kordofan ...	1,056	3·2	3·0	90	65	20·6	61·3
Blue Nile ...	780	2·2	2·8	95	65	28·3	53·7
White Nile	752	2·8	3·9	95	66	47·0	77·0
Bahr-el-Ghazal ...	541	1·4	2·5	94	63	62·9	87·6

The incidence is seen to be fairly constant throughout the Sudan. Suakim forms an exception, which is to be accounted for by the fact that all the troops there are Egyptian, and that serious cases are invalided to Cairo. This latter fact, taken with the consideration that early cases are very usually admitted under other headings, probably explains the low incidence at Suakim. The high number of admissions in Cairo district is largely the result of transfers from other hospitals; but also depends upon a very high incidence amongst the small Sudanese detachments of artisans at the citadel workshops. These latter are very subject to tubercle in the cold and damp of the Cairo winter. On the whole, there is a higher incidence where the garrisons are almost entirely Sudanese, as in Kassala, Kordofan, the White and the Blue Nile districts, than where Egyptians only, or mixed garrisons,-

exist. The Sudanese who has been north and in contact with civilization is quite capable of being a carrier of tubercle bacilli, not only to his own regiment, but also to the civil population close to military posts. The actual incidence of tuberculosis upon the civil population is difficult to calculate. Only those living in the vicinity of military posts find their ways into Government hospitals; so that the small number recorded can give no idea of the total amount of the disease. On the other hand, there is good reason to believe that those not brought in contact with Government posts are not affected by it; and if this is so, the small number of cases noted *exaggerates* the total incidence in the country. This question will be more thoroughly treated under the heading of "Racial Susceptibility."

I find records of tubercle in out-station civil hospitals in the Sudan as follows:

	Cases.
Wad Medani (Blue Nile), 1902-1906	5
Kassala, 1906-1907	15
El Obeid (Kordofan), 1905-1907...	4
Bahr-el-Ghazal, 1902-1906	3

Of course, in large towns, such as Khartum and Omdurman, the conditions approximate to those obtaining in Egypt, and the incidence of tuberculosis is high. Kassala should perhaps be included amongst the latter. The presence or absence of tubercle amongst the wild tribes of the Sudan will be discussed later under the heading of "Racial Susceptibility." It may be stated here, however, that no proof exists that these tribes ever get tubercle in their natural state, although very susceptible to it if brought in contact with the germ. The tubercle bacillus appears to be absent from the Southern countries, except in the vicinity of Government posts.

The tribes amongst whom the disease is not known to exist are as follows:

TABLE INDICATING NATIVE SUDANESE TRIBES APPARENTLY FREE FROM TUBERCULOSIS.

Northern Bahr-el-Ghazal.	Southern and Western Bahr-el-Ghazal.	Southern Sennar.	Kordofan.
Shilluk	Golo	Hamag	Nuba
Dinka	Bongo	Berta	—
Nuer	A-Zandeh	Borun	—
Jur	—	—	—

Types of Tuberculosis.

It is impossible to obtain accurate figures as to types of the disease throughout the stations of Egypt and the Sudan. I append a short table showing the headings under which tuberculous diseases have been admitted at certain stations; but the number of years covered by the figures varies for different places.

TABLE INDICATING ADMISSIONS FOR DIFFERENT FORMS OF TUBERCULOSIS.

	Years.	Tubercle of Lung.	Tubercle of Glands.	Tubercle of Bone.	Peritonitis, Tubercular.	Orchitis, Tubercular.
Cairo ...	1903-1907	46	6	1	1	1
Wad Medani	1902-1906	9	1	—	—	—
Kassala ...	1906-1907	2	1	1	—	—
El Obeid ...	1904-1907	6	1	—	—	—

As is to be expected, pulmonary tuberculosis is far the most common type. In an inquiry dealing with the adults who have been subject to medical examination before their enlistment, cases of chronic glandular or bony tubercle are naturally very rare. To this must be added the fact that many of the latter cases would be diagnosed under different headings, such as "Enlarged Lymphatic Glands," "Inflammation of Connective Tissues," etc. The question of diagnosis bears very strongly on all figures applying to the Egyptian army. Many posts are under the medical care of young Syrian or Egyptian officers, whose accuracy of diagnosis is impaired by the language difficulty and other causes. I find, on going through old admission and discharge books that many acute cases of phthisis have been admitted under other headings, as bronchitis, pneumonia, anæmia, etc., and I infer that many such cases have escaped attention by not having the diagnosis altered before death, invaliding, or discharge.

A few remarks on cases admitted to the General Hospital, Abbassia (Cairo), during this year, under my own supervision, may be of interest. A total of sixteen cases have been treated. Of these, seven were acute miliary tuberculosis of both lungs. Six of these cases were fatal, the average duration being thirty-one days. One case improved and was sent to Wady Halfa, for treatment in a dry climate, before invaliding. One case of tubercular peritonitis was admitted, and invalided after improvement under treatment. Five early catarrhal cases of tubercle of lung were admitted. All these improved under treatment, and were invalided or are still in hospital. The one case of tubercle of bone admitted was of some interest. Nine years ago he had sustained

a severe injury to the right ankle-joint, which subsequently became infected with tubercle. He underwent three operations for removal of dead bone; and was subsequently cured by a very thorough operation performed by Dr. H. Milton, of Cairo. After nine years of good health, he began to suffer from pain over the middle of the right tibia, an œdematous swelling being visible at the site of pain. I diagnosed a tubercular abscess in shaft of tibia, which was confirmed on gouging through the anterior surface of the bone. The abscess was thoroughly scraped and swabbed with pure carbolic. After three months the patient left hospital apparently recovered. I mention the case owing to the long period (nine years) which elapsed between the first and second manifestation of the disease. Five of the admissions were Sudanese soldiers from the small detachment of Sudanese artisans under training at the Citadel. This large admission-rate from amongst the Sudanese is quite what experience leads medical officers to expect. A point of importance is that, on a special inspection being made, one chronic and one early case of tuberculosis were discovered in this detachment. It is quite possible that the "chronic" case had been the focus of infection to the others. The Sudanese soldier never reports sick if he can manage to carry on in barracks; which praiseworthy endurance may well be a source of danger to his fellows.

A series of three cases were admitted within a few weeks from amongst the Egyptian soldiers under instruction at the Army School of Music. One was of a chronic type, the other two acute. They had occupied the same or contiguous barrack-rooms. I have no doubt that these cases were etiologically connected; the practising with wind instruments, no doubt, increasing the liability to attack by the tubercle bacillus.

Racial Susceptibility.

The Sudanese under military conditions is much more liable to tuberculosis than the Egyptian. It is hard to obtain accurate figures; but, roughly, out of 172 cases of tubercle recorded during five years in the Egyptian army, 90 cases were Sudanese, while the total strength of Sudanese was less than half that of Egyptians.

TABLE SHOWING COMPARATIVE PREVALENCE AMONG EGYPTIAN AND SUDANESE SOLDIERS.

Race.	Average Annual Strength.	Average Annual Admissions for Tuberculosis.	Case Incidence.
Egyptian ...	10,840	16·4	1 in 661, or 1·5 per 1,000.
Sudanese ...	4,766	18	1 in 264, or 3·7 per 1,000.

The inference from these figures is inevitable, and is supported by the opinion of every medical officer to whom I have spoken, and of every civilian medical man whom I have been able to consult. The high mortality amongst Sudanese from this cause, when imported into Egypt, was an influential factor in regulating the price of slaves, in the days of a self-governed Egypt. The Shilluk and Dinka tribes were believed to be most susceptible, and consequently had a lower market value. Arguments might be multiplied to demonstrate this high incidence of tubercle amongst Sudanese, but the figures given are themselves sufficient to make further demonstration superfluous.

The question, then, naturally arises, "Is this high incidence due to a racial susceptibility, or to the conditions under which Sudanese exist in the army?" This leads to the further question: "Does the Sudanese suffer much from tubercle under natural or tribal conditions?"

The latter question is most difficult to answer at present. The wild tribes of the Sudan occupy territory that is but thinly garrisoned by scattered posts, situated on the main roads or watercourses. The people are very little in contact with Government, and consult the tribal witch doctor when ill, instead of enriching the statistics of the Government hospitals.

Captain Howard Ensor, D.S.O., writes:

"I am of the opinion that tuberculosis in any form does not exist among the indigenous tribes of the Bahr-el-Ghazal where they have not been brought into close contact with Egyptian and Sudanese troops. In the course of nineteen months spent in the Bahr-el-Ghazal, I can only remember to have seen one case of tuberculosis in a native of this district; this case was a man in the Jehadieh Police, a Dinka from Chak-Chak, in the western district.

"He was serving in the police force at Wau when admitted to hospital for phthisis, which was, no doubt, acquired during his service at the above-mentioned station through contact with the Egyptian and the Sudanese troops of the garrison. In the southern part of the Bahr-el-Ghazal, among the Nyam-Nyam tribes, I have up to the present not only never seen a case of tuberculosis among the aborigines, but all pulmonary affections appear to be extremely rare among them. In this way these people present a marked difference to the Sudanese troops, whose liability to pulmonary complaints is so well known."

Major Dauncey Browning, R.A.M.C., to whom I applied for information as to the presence or absence of tubercle amongst the Bahr-el-Ghazal, Dinkas, and other tribes, divides the natives into the small number who have elected to live around military posts, who are closely associated with the Sudanese soldiers, and who apply for treatment when ill, on the one hand; and the vast majority of the people, who

have seldom or never seen a Government station, or been associated with the troops on the other. Amongst the former class he has seen three cases of tubercle; the origin of which might easily be explained by association with infected soldiers. Amongst the other class no cases have been seen; but this statement must be modified by the consideration that comparatively few individuals were actually observed. Major Browning, however, during journeys through the district, won the confidence of the natives to such an extent that he had considerable numbers of patients for minor surgical treatment, and he saw no tuberculosis amongst these. My own experience, during a year as S.M.O. of the Bahr-el-Ghazal is similar to his, except that I saw no cases amongst the people close to Government posts; their association with the troops having been only of a year's duration in 1902.

Major H. A. Bray who was S.M.O. of Bahr-el-Ghazal in 1904-1905, does not recall having seen any tubercle amongst the wild people, but adds that he did not see many of their sick.

Lieutenant Greville Anderson, S.M.O. of Kordofan district, after having sent figures as to the number of cases in the Civil Hospital at El Obeid, amongst natives associated with troops, writes as follows: "I have just returned from an inspection of Taiaia, Sherkeila, and Rabat, where I made inquiries about the presence of tuberculosis, with quite negative results. These places, being off the beaten track, and unvisited by the white or yellow man, are apparently free."

Inquiries as to tuberculosis in Sudanese cattle have elicited only negative information. Dr. Andrew Balfour, Director of the Wellcome Research Laboratories, Gordon College, Khartum, writes: "I have not a single good specimen of bovine tuberculosis in the museum, and I do not think that tubercle is common. I have never heard of it as occurring amongst the cattle in the south. Avian tuberculosis occurs. I have met with it in turkeys."

Major Dauncey Browning reports: "As regards local cattle, I have had the opportunity of examining a large number, both before and after slaughtering. In no case have I met with evidence of tubercular disease."

Lieutenant Greville Anderson writes: "I hear that, at Sherkeila, in Southern Kordofan, two tubercular beasts were condemned and destroyed by the Mamur (local magistrate) about a year ago." In Kordofan there is considerable traffic in cattle from one tribe to another.

My own experience in the Bahr-el-Ghazal quite bears out the above reports. I may add that, in many shooting trips, I never came across any appearance of tuberculosis in cutting up animals. I conclude that, if present at all, tuberculosis is exceedingly rare, amongst both man and beast, in the countries occupied by Sudanese tribes where free from contact with foreigners from the north. It

appears, then, that the high incidence amongst Sudanese soldiers contrasts dramatically with a low incidence amongst the Sudanese tribesmen. Is this to be attributed to the conditions of military service? I have already laid stress upon certain points which, in my opinion, are likely to condition the spread of tuberculosis amongst the Sudanese in the army. I do not consider them, however, sufficient to account for the high incidence noted. All the conditions noted derive their importance chiefly from their contrast with the state of savage and primitive nature which is the lot of the tribesman; and nearly all have an equal or greater bearing as factors of disease amongst the Sudanese who live in Northern Sudan stations and Egypt as civilians.

It is not military service, but contact with civilization, that would seem to determine the liability to tubercle; and the direct cause of this is contact with the tubercle bacillus. It is dangerous to infer too much from the scanty information obtainable as to the absence or presence of tubercle amongst the Sudanese tribes; but that it is at least very rare may be considered to be demonstrated. On the other hand, it is common in Egypt. Large numbers of cases are treated in Kasr-el-Ainey Hospital. Many patients in Cairo Lunatic Asylum suffer from the disease, which caused, for instance, eleven out of a total of seventy-six deaths in that institution during 1906. A large number of Egyptian cattle are affected, as I am informed by Dr. Charles Todd, who saw many cases when working at the Serum Institute on cattle plague duty; and, in fact, the disease has a thorough footing in Egypt. It is therefore probable that a wild Sudanese who leaves his country for military service or other occupation to the north, comes in contact, for the first time, with the tubercle bacillus.

When such catchwords as "hereditary tendency" are recalled, it might be thought that such a man is in a better condition to resist the disease than one whose race is largely affected by it. A moment's reflection, however, brings it to mind that the children of healthy parents in a community affected by tuberculosis belong to a stock that has hitherto successfully resisted the disease; while the offspring of men whose race has been free from tubercle have had no such disease to resist. It has still to be proved whether the latter would be in a worse condition of defence than the former; but if a tendency to the disease can be transmitted, as appears to be finally established by Professor Karl Pearson and others, the converse may well be the case. That it is so seems to be indicated by this liability of Sudanese to tubercle when brought in contact with it, which can be most easily explained by the supposition that they have no hereditary resistance to the disease.

Thinking that it would be interesting to compare the phagocytic index of healthy Egyptians and Sudanese, I carried out a few opsonic -

observations in Cairo district. The number is too few to be of much importance, but general duties leave little time for such work.

TABLE OF OPSONIC VALUES OF HEALTHY EGYPTIANS AND SUDANESE.

Date of Observation.	Egyptian: Total Bacilli in 50 Leucocytes.	Sudanese: Total Bacilli in 50 Leucocytes.	Remarks.
7-6-07 ...	59	78	
17-6-07 ...	70	76*	* A tuberculous Sudanese examined with the others on 17-6-07 had a count of 108 in 50 leucocytes.
25-6-07 ...	129	86	
4-7-07 ...	73	46	
11-7-07 ...	101	127	
18-7-07 ...	94	54	
Total ...	526	467	

It will be seen that there is little difference, as far as the observations go, in the opsonic value of serum from healthy Egyptians and Sudanese in Cairo. This is to be expected, as the Sudanese used were all men who had served for some time in the army, and might be presumed to have manufactured opsonins sufficient for their protection, under the influence of occasional contact with the tubercle bacillus. A series of observations on Sudanese and Egyptians or Englishmen in the Bahr-el-Ghazal would be of great interest.

With these remarks I must leave the subject of racial susceptibility. It appears to be a question of the highest interest, on which little information is at present available. The opportunity for a thorough investigation of the liability to tubercle in such primitive races as the Dinka and Shilluk still exists; but, with the advance of civilization, the isolation of these peoples will soon cease, and the opportunity will be lost.

A close parallel exists amongst the Quadrumina under natural and artificial conditions. The wild monkeys of the Sudan appear to be quite free from this disease. I have seen many recently captured, and all appear quite healthy. On looking up the subject I find that Campbell found tubercle in 20 out of 38 post-mortems on monkeys in the London Zoological Gardens, and Forbes noted a percentage of 43 in 173 monkeys examined.

In conclusion, I have to express my indebtedness to Colonel G. Douglas Hunter, D.S.O., Principal Medical Officer, Egyptian Army, for his kindness in permitting me to make use of all records available on the subject of tuberculosis amongst Egyptian and Sudanese troops, and to thank my brother-officers, acting as S.M.O.'s of districts, for their uniform kindness in obtaining and sending me information on the subject. Without their kind help this paper could not have been written.

ORIGINAL PAPERS.

THE PRACTICAL APPLICATION OF WILTON'S MORTALITY CURVE FOR PHTHISIS.

By W. RAMSAY SMITH,
D.SC., M.B., C.M., F.R.S.E.,
Permanent Head of the Department of Public Health of South Australia.

Some years ago my attention was drawn to the subject of estimating the number of consumptives alive in this State.[1] I may here give a brief résumé of the history which ended in the establishing of what I have termed Wilton's Mortality Curve for Phthisis. An estimate was required some years ago for the purpose of giving an idea of the provision that would be necessary for consumptives, presuming that the Government should see fit to undertake the care and treatment of patients. From the very imperfect data at my disposal, I estimated that the number of consumptives in the State was probably not more than 500. This gave rise to some expressions of dissent.

The collection of facts regarding the duration of phthisis is, no doubt, the work of the physician; but the interpretation of them had better be entrusted to the actuary or the mathematician. Recognizing this, I proceeded to deal with the matter in as scientific a manner as I possibly could.

Dr. James Clark[2] had combined Bayle's 200 cases and Louis's first series of consumptives, and had made a table showing—(*a*) How many of an original hundred persons would die by the end of the third month, sixth month, etc.; (*b*) the number living; and (*c*) how many die in the various periods of the disease. I wished to know whether it was possible, from these data, to obtain a co-efficient of the death-rate that would give the number alive at any given time; and the table was given to Mr. J. R. Wilton, then of the Adelaide University, now of Cambridge. From the data supplied he constructed a curve, which, he said, might be interpreted thus: "At any time the number of those who will die in the next month is one-twelfth of the original hundred who are yet alive."

[1] The story of my inquiries is related in *The Scottish Medical and Surgical Journal* for October, 1902.

[2] "Cyclopædia of Practical Medicine," vol. iv., p. 276.

As applied to any actual case, this means one-twelfth part of every original hundred alive at the beginning of any month will die by the end of that month; therefore, in a community where consumption is neither increasing nor diminishing, twelve times the monthly death-rate will equal the number of consumptives alive at any given time; in other words, and speaking roughly, the annual total of deaths is the number alive.

After this I combined Louis's two series, making a total of 307 cases, and gave Mr. Wilton the duration of the disease in every instance. From these data he constructed another curve, on which he remarked: "This curve may be taken to indicate that the deaths in any month between the third and fifteenth number about one-tenth of those alive at the beginning of the month." As he showed, the calculated figures corresponded in a very remarkable manner with the actual numbers given in the tables; the theoretical very closely agreed with the practical.

Speaking on the subject of the number of consumptives alive, I said with reference to Wilton's Curve: "This means that, in South Australia, we may with fair certainty estimate the number at about 300 persons. This is the first piece of solid groundwork on which State or philanthropic action has to be based. To my mind, all the statistics of the British Congress, and they are not many, are of minor importance to us, or to others, compared to Mr. Wilton's Mortality Curve and its interpretation."

At that time I accepted Mr. Wilton's Curve and its interpretation as being a very accurate means of estimating from the death-rate the number of consumptives alive at any time in an average community. But the subject gave rise to a good deal of discussion. Some people, not mathematicians, condemned the conclusions as palpably wrong, seeing that they were so inconsistent with what one had been accustomed to believe, and so much at variance with first thoughts begotten by the interpretation.

Since compulsory notification of pulmonary tuberculosis has been in force in this State for the past eight years, we have a means of testing this matter. Of course allowances have to be made for cases of sufferers who consult no medical practitioner, for a certain percentage of possibly unnotified cases of persons who do, for consumptives who may die from other causes, for some who leave the State, and for some who recover. All these influences tend to modify the results in one direction or the other.

From week to week and from month to month the notifications and the death returns have been before me, and I have been struck with the general agreement of the two numbers. Desiring, however, to test the matter more thoroughly than by these totals, or by the results

shown by the "Central Register of Consumptives" kept in my office, I called for a nominal return from the local boards of health of all consumptives reported to them at any time, and known to be alive on December 31, 1906. I also received returns from hospitals, consumptive homes, and sanatoria. In this way it has been possible to correct double notifications and other disturbing elements, and so to make a comparison between the number reported during the year, the number of deaths during the year, and the number known to be alive on the last day of the year. The following table gives the statistics of the two first:

Year.	Cases Reported.	Deaths.
1899	220	318
1900	310	301
1901	352	306
1902	323	299
1903	346	305
1904	333	298
1905	352	290
1906	341	307
	2,357	2,106
Average for seven years	336·7	300·8

In calculating the totals and averages, I have excluded the year 1899, since the requirements of the Act were not fully, nor even fairly fully, carried out. A little judicious pressure on negligent medical practitioners appears to have brought the notifications in the following years up to something near the correct figures.

The total number of persons reported at any time during the past eight years, and known to be alive on December 31 last, is 308. This result is very remarkable when compared with the 307 deaths reported during the year, and with the annual average of 300 deaths. There were, however, 36 persons in consumptive homes or sanatoria on that date who had not been reported to any local board as suffering from pulmonary tuberculosis. They may or may not have been suffering from this disease; but if we include them all, the total would be 344. Further, I may mention that, in their endeavours to be exact and to be helpful, the local boards sent lists of persons, numbering in all 50, who had been reported within the past eight years, but whom they could not trace. These the officers of the Central Board have also failed to trace; so it is probable that very few of these are at present alive in the State.

Allowing for all these disturbing influences, it will be granted, I believe, by statisticians that, when tested by Wilton's Curve, these

results agree closely enough to inspire one with confidence that, given the annual death-rate, the number alive at any given time may be estimated with sufficient exactness for any practical purpose, especially for estimating the amount of accommodation or provision necessary to be made in any community.

In estimating the value of these statistics, one cannot ignore the fact that the numbers dealt with are not large. At the same time, there are some circumstances that add to their trustworthiness. If there were only one year's figures of deaths, then the possible variation, according to Poisson's rule, would be very considerable, and not much stress could be laid upon the results. When, however, a record of seven or eight successive years shows such slight variation or fluctuation as is graphically shown in the table, one is justified in inferring that the

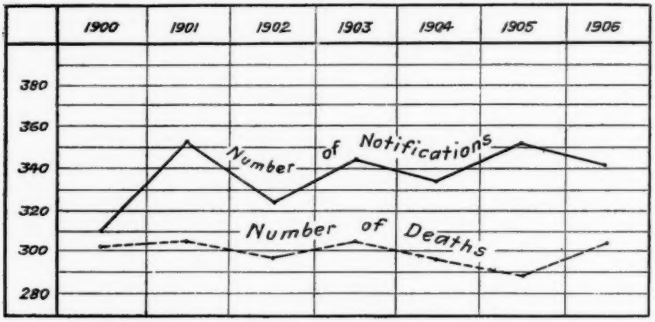

TABLE INDICATING PROPORTION BETWEEN NOTIFICATIONS AND DEATHS OF CONSUMPTIVES IN SOUTH AUSTRALIA.

death-rate from year to year is a fairly constant quantity. The numbers of notifications vary a good deal more than the numbers of deaths; but these notifications may be subject to a greater number and variety of disturbing conditions.

Since the practice of notification of pulmonary tuberculosis may be said to be still on its trial, some remarks on one or two phases of it may not be out of place.

Under our Act, "Every medical practitioner attending on or consulted by any person suffering from pulmonary tuberculosis shall, as soon as the fact becomes known to him, report the same to the local board of the district in which the person resides: Provided such notification shall not be necessary if the case has been previously reported to the same local board."

Pulmonary tuberculosis is not classed as an infectious disease, and is, therefore, not notifiable by anyone except the medical practitioner. Further, since it is not an "infectious disease," no ee is legally payable

for notification. Some local boards of health, however, recognize that what is worth having is worth paying for, and they pay the notification fee. This, if not an inducement to notify, removes at any rate any objection or excuse that practitioners may have for becoming careless in performing their legal duties.

In some places an objection is made to notification on the ground that it is followed up by visits of inspectors or nurses, and annoyance to the patient or his friends, or even by actual harm, inasmuch as the patient becomes cognizant of the nature of his disease, greatly, it may be, to his detriment. The Central Board of Health has stated, in answer to questions by local boards, that, if a medical practitioner, in reporting a case, has said that visitation by the officers of the local board is not necessary, the local board may assume that such a practitioner will have himself seen that all necessary instructions have been given and precautions taken.

One thing more: Notification is made the basis of treatment in sanatoria assisted by the State, public philanthropists, local authorities, or private individuals; and much is thereby done for the treatment and cure of the afflicted and the affected. No one would say a word against doing all that is necessary in this way, nor would anyone desire to restrain sympathy or practical philanthropy towards consumptives and their needs. It is a question, however, whether we are not in danger of directing our attention too exclusively to the treatment and the cure, and of neglecting what is equally important, if not even more necessary, viz., stopping the supply of consumptives. It may be that, with means at our disposal to alleviate, we ignore too much the conditions that originate and breed tuberculous disease in the population —filth, overcrowding, bad food, bad drink, and such-like. Social science and sanitation will not advance much if owners of insanitary property and careless landlords are allowed to draw profits from breeding-grounds of disease. There would be less necessity for donations to charitable and other institutions if such individuals were compelled to do their legal duties. Slum-owners salving their own consciences and stopping public criticism by contributing to sanatoria should form a fit subject for "Cynicus." And the prime duty of local authorities is not to provide or maintain places for consumptives, but to use every legal effort to abolish the conditions that make consumption possible.

THE MANAGEMENT OF SANATORIA FOR WORKING MEN.

By HAROLD DOWNES,
M.B., L.R.C.P.E.,
Physician to Bellefield Sanatorium, Lanark.

The management of sanatoria for the working classes demands attention to certain points which are not so essential in those institutions which cater for the well-to-do consumptive. The better-class patient takes the treatment more seriously, or if by his own actions he fails to take advantage of his opportunities, it is his own money which is wasted: but charitable funds must be expended by those employed in their utilization with the steady aim of getting the best economic results they will produce.

Frequently the working man is intelligent and quick to observe the many details which demand his co-operation in order to effect a permanent cure, but the undisciplined type is always in evidence in considerable numbers. He is accustomed to no restraint, and he resents authority even when exercised for his own benefit. He looks upon rules as unnecessary restrictions, to be circumvented if possible; he has the usual tendency to undervalue gratuitous advice; and his preconceived notion of a sanatorium is a kind of holiday home where he expects to be well fed and cared for, but where he will be allowed to do pretty much as he pleases, provided he observes certain hours and behaves with reasonable moderation.

As bearing closely upon the question of administration, it may not be out of place to refer to a few points which it is desirable to bear in mind in selecting a site for an institution of this character, in view of facilitating the future maintenance of order and attention to medical instructions. It should be situated at least two miles from a town, and the same distance from the nearest public-house, especially where patients are to be allowed to take exercise outside the grounds. It is preferable that the extent should be sufficiently great to allow of all walks being taken within the precincts. The configuration of the ground should be such that the whole area may be readily surveyed from the sanatorium buildings; if otherwise, and the doctor has to depend upon his rounds in order to ascertain what each patient is doing, he will become conscious of the existence of a code of signals designed to announce his approach, and yet will find nothing further to indicate that a quiet gamble or other forbidden amusement was in progress before the needful warning was given. All communications

with the outside world are best discouraged, and if an *exeat* is allowed it is well to ascertain that it does not coincide with the "afternoon out" of one of the ward-maids or of the domestic from the nearest farm-house.

Admission of Patients.

Subscribers' letters are an abominable hindrance to good results. Each case should be examined by the resident physician before it is accepted. If, as should be the case, he is a man of special experience, he is probably the best judge as to suitability. If different examiners are allowed to pass cases, it will be found that standards of eligibility vary greatly, and especially will this be the case if the patient's own doctor is left to decide as to his suitability, as he may be unconsciously biased in favour of the applicant. Moreover, if the physician is expected to show the best results, he ought to have the advantage of selecting his own raw material. Patients who have already been in other sanatoria are best discarded, as if of a discontented turn of mind they are continually making comparisons, to the disparagement of their present location.

A long waiting list should never be kept, and waiting candidates should be re-examined every four weeks. An understanding should be arrived at beforehand as to the period of treatment required, and a minimum period of four months usually insisted upon, for these patients often apply with the idea of returning to work in a month or so. Cases taken in for a short time "for educational purposes" do not, in the writer's experience, repay the trouble and outlay involved in training them, and they give the public a false idea of the results of sanatorium treatment.

Staff.

One *resident physician* can supervise about forty patients, but much will depend upon the arrangement of the premises and the configuration of the ground. Châlets are objectionable from an administrative point of view, and the best type of building is one comprising a series of small wards all on one floor. The head of such an establishment should be a man of experience, specially trained for the work; but the notion which prevails in the minds of lay committees, that any ex-house-physician is competent to manage a sanatorium, will probably die hard. The man who, after holding surgical, maternity, lunacy, and other appointments, turns his attention to phthisis for the purpose of "getting up his chest work" is not likely to remain long or to be very successful. He should possess tact and patience, with an enthusiasm for the work which is not to be damped by many disappointments. He should not be averse to an isolated life, and he should be a man of hobbies. It is needless to say that he must have

a knowledge of men, and be able to maintain discipline in an unobtrusive manner.

A consulting staff is of value in cases of difficulty, but a visiting staff giving attendance even as frequently as twice a week is of little use where treatment has to be varied from day to day.

The *matron* should be fully trained and have special experience. She should be sympathetic, firm, and tactful, able to quietly control both her staff and the patients. She must be a good and economical housekeeper. A good matron is of incalculable value in influencing restive patients.

Four *nurses* are sufficient for thirty beds, six for fifty, and so on. Three years' training is unnecessary; one year should be sufficient. Many of the nurses' duties consist in waiting at table, kitchen work, and other household matters which do not call for special experience. They must be good disciplinarians, and know how to check any approach to familiarity on the part of the patients. One nurse must always be detailed for night duty.

Rules.

It is said that rules should be as few as possible, and no doubt this is true as a general statement, but in a sanatorium the more important regulations must be set out in black and white, or there will be trouble. Chief amongst all rules will be that anent spitting, and this ought to be made a capital offence, the first detection to carry dismissal as its consequence. As a rule, if the danger has been properly explained, there is not much trouble with regard to this matter, but occasionally one meets with men who look upon the prohibition as an unwarrantable interference with the liberty of the subject. The writer once had under his care an individual who used every morning to retire to an obscure corner of the grounds, and there indulge in ten minutes' comfortable expectoration, "to show his independence."

Smoking is difficult to legislate upon, and it is best to attack the matter indirectly. For example, we prohibit smoking indoors, when at exercise, during the half-hour's rest after meals, and for at least an hour before meals. Thus the time available for the consumption of tobacco is decidedly limited, which is found to be more practicable than restricting the quantity.

Visitors.—Patients' friends are generally admitted once a week, which is more than sufficient, as visitors have a disturbing influence. The usual hospital rules will be enforced with regard to the introduction of articles of food and drink. The writer has had less trouble with these matters than with "lung tonics" and patent cough lozenges, which the friends are apt to bring as a contribution towards the patient's recovery. It is not advisable to permit the men to leave the sanatorium with their friends.

Daily Routine.

The time must be divided into definite periods of rest, exercise, work, meals, and sleep. In the correct apportionment of these several factors to suit each individual case the physician's skill is shown: the amount of each will naturally vary with the patient's condition and the length of time he has been under treatment. It is difficult to make new arrivals understand what is meant by *rest*, and they require careful watching for some time. Patience is required in order to make them walk slowly; they are apt to hurry in cold weather. By placing a new patient with one who has learnt his lesson this end may be attained.

With regard to *work*, the writer is a strong advocate for its adoption in a systematic manner in all institutions of this kind. The arguments in its favour are well set forth by others, so that it is not necessary to make any further reference to it here. Chronic ergophobia is one of the most dangerous sequelæ met with in the modern treatment of phthisis, and one which should be energetically combated by every means in our power.

Games must be permitted in moderation. The working man is not a great reader, and recreation of some kind is a necessity, especially in winter and bad weather. Bagatelle, chess, draughts, and dominoes are innocent and unexciting pastimes. Cards should be altogether forbidden, both as being too exciting and also on account of the habit of the British workman of moistening his thumb when dealing.

Religious services of some kind are usually held on Sundays. These are generally of an undenominational character, and no regard should be paid to alleged conscientious objections, which multiply alarmingly if encouraged. Exceptions must be made in the case of Roman Catholics and Jews.

The secret of success, as in other things, consists in close attention to small details. In spite of occasional disappointments in individual cases, there is no kind of institutional work more fully justified by its results than the sanatorium treatment of consumption amongst the working classes. It has been clearly shown by Bardswell[1] and others that, given a fair proportion of early cases, fully 40 per cent. of those treated represent permanent cures—a result which the present writer can endorse from his own experience. Of those that are not cured, a large number can work for a sufficiently long period to repay society for the amount which has been expended upon them; in fact, to quote the author just referred to, "many a sanatorium failure represents a considerable measure of philanthropic success."

[1] Bardswell, N.: "The Consumptive Working Man"; London, 1906.

THE WORSHIP OF MOLOCH.

By LEONARD WILLIAMS,

M.D., M.R.C.P.,

Physician to the French Hospital; Assistant Physician to the Metropolitan Hospital.

> "*First Moloch, horrid king, besmeared with blood*
> *Of human sacrifice and parents' tears . . .*
> *. . . Him the Ammonite worshipped in Rabba.*"
>
> PARADISE LOST, I., 392.

IT is now several years since, in the matter of the treatment of tuberculosis, the medical profession publicly abjured its former beliefs and commenced a vigorous crusade in favour of the new gospel. The riddle of the white plague, which had so long defied solution, had been read at last; the dreary watches of the night were over; and the dawn, with its promise of victory, peace, and purity, was really at hand. The profession, fully awakened to the sense of its preventive mission, was about to instruct the laity in the truths, whose ready adoption would shortly lead to the total abolition of consumption and all its attendant horrors. With the successful establishment of a BRITISH JOURNAL OF TUBERCULOSIS, the time seems ripe for a review of the situation; for an inquiry into the distance which we have accomplished along the road to the land thus promised, and an estimate of the forces which are still opposed to us.

In the original propaganda issued by the enlightened authorities of such towns as Glasgow, emphasis was properly laid upon the two main factors in the production of the disease—namely, the seed and the soil; the bacillus itself, and the nature of the human pabulum upon which it displayed its most luxuriant growth. It was pointed out that the bacillus was an infective organism which could be communicated not only directly from one person to another, but indirectly by aerial infection, by sputa, and possibly by other dejecta. In order to cultivate a soil thoroughly inimical to its development, stress was laid upon the importance of sunshine and fresh air, of exercise and wholesome food, and the other conditions favourable to healthy development and vigorous animal existence.

The new gospel thus contained two articles which were essential, both of them to the end in view, and each of them to the effectiveness of the other. Abstinence from kissing and the avoidance of spitting, important as they undoubtedly were, would nevertheless prove futile in the proposed campaign unless they were accompanied by an active cultivation of the open window, and the full utilization of aerial and solar disinfection and prophylaxis. Such a creed constituted a

complete reversal of the principles which had up to that time guided both the profession and the laity in their attitude towards tuberculosis. It represented, in fact, a *volte face* as surprising in its suddenness as it was unpleasant in its application, and its apostles realized that nothing short of combined and sustained action would ever succeed in compelling its general acceptance. To what extent has this action been combined and sustained, and what has the campaign effected?

So far as the treatment of demonstrable tuberculous disease is concerned, it is pleasing to record that a great deal has been accomplished. The establishment all over the country of well-administered sanatoria, in which the two articles of the creed are strictly and even rigidly practised, has been the means of arresting hundreds of cases of incipient phthisis, and of prolonging life in numberless instances. Even if the work of the sanatoria stopped short at this point, these institutions would have already more than justified their existence. But it does not. The influence of the sanatoria is not purely, or even mainly, therapeutic. Their educational effect is more decided and far-reaching than their curative can ever hope to be. Every patient who from one of them returns to his ordinary life is, as a beneficiary should be, a convinced, an active, and even fanatical propagandist of the principles of which they are the expression, and he converts the members of his family, his associates, and haply his doctor, to a belief in the hygienic practices which he has learned. Such work is of immense and enduring value, and even if it were true, as is not infrequently suggested, that all sanatorium patients eventually relapse, there remains to the credit of these institutions the untold good they have done in illustrating and popularizing the need for the minutest attention to the two essential articles in the true faith.

It is impossible too highly to praise the work, more especially the proselytizing work, of the sanatoria, but when we come to inquire into the nature and the degree of the support which, in this direction, they have received, and how their educational efforts have been seconded by responsible people outside, there is a sad tale to tell. The sadness resides partly in the fact that many of those who ought to help, do nothing but hinder, and largely in the very one-sided view of the necessities of the case which is taken by those whose intentions are excellent. These necessities we have seen to be admittedly two in number—namely, the avoidance of spitting and promiscuous osculation on the one hand, and the cult of the open window on the other. It is a question of seed and soil. If the seed fall on stony places it is as powerless and ineffective to-day as it was when the parable was first spoken, and the condition most inimical to its germination is still a hard soil with abundance of sunshine and its accompanying purity of atmosphere.

Of these two factors, the seed and the soil, the power of the former has been unduly magnified, while the importance of the latter has been, and is being, unduly, grossly, and even flagrantly minimized. Except for some very laudable and effectual attempts on the part of public authorities to prevent the contamination of milk and other foods, and the placarding of railway carriages and stations with notices against spitting, the crusade against consumption may be said to have degenerated into a pious opinion that the bacillus resembles the socialist in being a very wicked and obtrusive person whose existence it is well that people of refinement should forget. Of the other element in the problem—namely, the question of the soil—nothing, or next to nothing, is ever heard except from those who have experienced the benefits of sanatorium treatment. The air is loud with ignorant chatter about "catching colds," about the dangers of night air and wet feet; churches and other public places remain asphyxiating and pestiferous; the brutalizing fight for the open window continues to be a degrading necessity on every railway journey; sick-rooms preserve their deathly stillness of fœtid atmosphere, and the ordinary consulting-room its unedifying freedom from all suspicion of ventilation. Children are still alcoholized, improperly fed, under-exercised, and over-clothed; "specific" mongers and quacks with panaceas dietetic, gymnastic, and electric, hold sovereign sway in a society which believes only in appendicitis. Draughts and chills, Belial and Moloch, are worshipped with impious assiduity in every household, and the community is daily sacrificing at the altar of these cruel and debasing idols the lives of its brightest and most promising children.

And the pity, nay, the horror of it all, is that the backsliding is most noticeable precisely there where militant activity should be most conspicuous. The profession, which ought to be triumphantly leading the crusade, allows itself to be dragged ignobly at the tail of discredited shibboleths. The family doctor in a diagnostic difficulty takes hurried refuge in the "chill" which he knows will be accepted with all the readiness of a simple faith, and thereafter is obliged to live down to the theory in which he has weakly and tamely acquiesced, to the extent even of prescribing the exclusion of air, the multiplication of wraps, and the trial of new drugs. The average consultant pays lip-service to the true faith by suggesting to his patients the austerities of Nordrach and Davos, while reserving to himself the lotus-like luxuries of an unventilated consulting-room and heavily-becurtained bedchamber.

The health-resort practitioner, though justly proud of the climatic virtues of his station, can think of no more convincing method of employing these virtues for the benefit of the patient coming from a distance than by keeping the latter in the four hermetically-sealed walls of the lodging-house against which, under a similar regime, generations of consumptives have coughed their pathetic but futile sufferings.

If this description does not apply to all—which, happily, it certainly does not—then, quite as certainly, it applies to far too many. Who, for example, is to instruct the laity if its members fail to receive wise and enlightened counsel from him whom in sickness and in health they have learned above all others to trust? The very fact that the public clings tenaciously to the theory of obscure chills and hugs heroically the dread of wholesome draughts, constitutes in itself a grave indictment against professional advice as a whole. The family doctor has it in his power—by precept, practice, and example—to convince and convert hundreds of people in a few months. That he has not done so, and is not doing so, is writ large in the habits and customs of the vast majority of households.

As for the ordinary consultant, if his views are to be gauged by his practice, they are heretical indeed. To enter his consulting-room on any morning immediately after the last patient has left it, is to encounter an atmosphere which stifles verbal speech. To walk in the night season up one of the streets in which the caprice of female novelists compels him to reside, and to count the number of open windows, is to marvel that there are so few breakdowns among those who, in return for contumelious treatment from hospital committees, toil gratuitously and conscientiously during the best part of their lives. To sit anywhere in his vicinity at a dinner-table, and to suggest that the flesh-and-smoke laden atmosphere should be sweetened by the opening of a window, is to provoke a scene which it would be scarcely possible to equal by the announcement that a man-eating tiger was at large in the corridor. And these—some of them, at any rate—are those who are charged with the scientific and hygienic equipment of the medical student of to-day. What wonder that the latter, when he goes into practice, should view the articles of the true faith with the indulgent contempt properly accorded to the senile babblings of a few faddists?

The attitude of the average health-resort practitioner is frankly antagonistic. He appears to believe in climate, not in methods; in men, and not in measures. For him the sanatorium exists for the sole purpose of proving the futility of climatic considerations; so with characteristic British obstinacy he abuses it in good set terms, and defiantly refuses to learn anything from its methods, which he regards with the same unreasoning hatred as the stage-coachmen regarded the steam-engine. In order to vindicate, on the one hand, his consistency, and the "salubriousness" of his climate on the other, he treats his patients on principles the exact reverse of those which obtain at the sanatoria, so that the invalids derive as much benefit from his interpretation of what is meant by climatic treatment as they would from contemplating a coloured photograph of the esplanade of his health resort placed upon the library mantelpiece in London.

The appreciation of the "seed" factor and utter neglect of the "soil" factor is an obsession, which afflicts also our well-meaning, but depressingly unimaginative, public bodies. Their understanding of their duties in this matter would seem to be comprised in the liberal supply of placards which warn people against spitting in public places. These placards are theoretically excellent; but when they are displayed, as they usually are, in places which, owing to the absence of any effective ventilation, are already seething with infective organisms of every description, their utility may be regarded as doubtful. But inasmuch as they imply that spitting is hygienically the one unpardonable crime—that it is, for example, more pernicious than the closed window—these placards are not only useless, they are positively dangerous in their misleading futility.

But perhaps the most convincing evidence of the general misunderstanding of the needs of the situation—the apotheosis of the "seed" side and the neglect of the "soil" side—is to be found in the demand for the compulsory registration of tuberculous persons. Apart altogether from the unnecessary cruelty which such a course would entail, one would have thought that its uselessness would be apparent to the least adventurous thinker. With every hospital physician it is a notorious fact that a person may be the subject even of advanced phthisis before he deems it necessary to seek advice. What, then, can be the advantage of isolating a few cases when others, possibly the majority, are necessarily allowed at large? If compulsion there is to be, in the name of humanity and common sense let it take the form, not of the compulsory registration of the seed, but of the compulsory fortification of the soil. In this direction there is much that might be done, and ought to be done, and done promptly. There is, for example, the altogether admirable and wholly practicable suggestion made by an enlightened layman (probably an ex-sanatorium patient) that certain railway-carriages should be marked "open window," even as certain others are marked "smoking" or "ladies only." The railway companies, many of which are ludicrously lavish in the matter of non-spitting placards, have none of them, so far, adopted this much-needed and reasonable concession to modern ideas.

It is the fashion among the ignorant members of the leisured class to abuse the sanitary authorities for insistence upon adequate drainage and pure water-supply, but, happily for the community, this insistence increases rather than diminishes. Is it too much to hope that before long these same authorities will add pure air to the list of those things which may be properly and profitably imposed upon an ignorant, obstinate, and rebellious public? The noise of the motor omnibus is considered a fitting subject for local by-laws and restrictive legislation. That is as it should be. But from the public health point of view, it is

absurd to rail at the noise of these vehicles when their interiors are allowed to remain sinks of unventilated sanitary iniquity, as depressing to the vital resistance as they are offensive to the senses. Before we are called upon to add to the sufferings of the tuberculous person by placing him under police surveillance, let us at least require that our railway carriages, our public vehicles, and, above all, our "tubes," shall be freed from the reproach, which now deservedly attaches to them, of being more effectively tuberculous than a dozen tuberculous persons.

And these considerations apply in a very superlative degree to the state of our public buildings. These buildings are compulsorily so constructed so as to afford every reasonable facility for escape in case of fire. That, again, is entirely as it should be. But fire is nowadays, happily, a very unusual occurrence; whereas depressed vitality from unhealthy atmospheres is not only the most common, but in its baneful effects and maleficent possibilities it constitutes the most serious danger which can threaten the health of the community—a danger which is none the less real, constant, and pressing because it happens to be silent, stealthy, and insidious. Nevertheless, there is no such thing as compulsory ventilation. If the solicitude displayed by the State on the subject of the health of criminals, lunatics, and paupers is properly described as grandmotherly, then the utter and callous neglect of the claims of ordinary citizens in the same direction may reasonably be called stepmotherly. The criminal cannot breathe foul air, however much he may prefer it. The ordinary citizen, should he desire to attend divine service, to witness a theatrical representation, or assist at a concert, is obliged either to suffer an atmosphere laden with a fine assortment of pestiferous and debilitating germs, or stop at home. Such a state of matters constitutes the most cruel and intolerable form of tyranny—the tyranny of an ignorant and uneducated majority over a refined and enlightened minority. It is already more than high time that the minority in this matter bestirred itself into educating and convincing the majority. Efficient drainage, pure water, and reasonable precaution against fire have been wrested for us from the combined forces of ignorance and vested interests; and it is gratifying to record that of these the first two, at any rate, were won for the present generation at enormous sacrifice by the courage, the foresight, the determination, and the public spirit of former members of the profession.

Are we, the profession of to-day, to rest unmindful of such traditions and uninspired by such example? Pure air is well worth fighting for. In the light of our present knowledge it would seem, indeed, to be almost more worthy of attainment even than efficient drainage and pure water. In such circumstances it surely behoves us to awaken

from our present deplorable lethargy and to vindicate the worthiness of our descent, no less than the reality of our mission, by doing stark battle with this Ammonite, firmly entrenched though he be, in his grim and grimy stronghold of Rabba.

SINGING IN ITS RELATION TO PULMONARY CONSUMPTION.

By R. MURRAY LESLIE,

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Physician to the Royal Hospital for Diseases of the Chest, London;

AND

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Honorary Laryngologist to the London College of Music.

It is now universally admitted by the medical profession—and more particularly by those members who have made a special study of diseases of the chest and throat—that singing, including the various exercises, vocal and respiratory, incidental to the art, is one of the most valuable prophylactic and curative measures in the treatment of consumption and other pulmonary affections.

With regard to the prevention and cure of consumption, there are three great essentials: (1) The securing of the free passage of pure air into the lungs; (2) the maintenance of the elasticity and proper expansion of the chest; (3) the improvement of the general health.

1. *The Securing of the Free Passage of Pure Air into the Lungs.*—This is secured by the teaching of correct nasal breathing. It is a scientific fact that the air inspired through the nose is practically germ-free, whereas that inspired through the mouth is loaded with organisms, often including the tubercle bacillus. This is particularly so amongst town-dwellers. It has further been proved by practical experience that the encouragement of nasal breathing, so essential a part of vocal training, is one of the best means, not only of preventing the development of adenoids and other morbid conditions of the nose and throat, but of aiding in their cure, and so increasing the capacity of the upper respiratory chambers.

2. *The Maintenance of the Elasticity and Proper Expansion of the Chest.*—For this requirement it is obvious that efficient elasticity and expansion of the chest can be best secured by properly regulated

breathing exercises. It is well known that tuberculosis usually starts in the apices of the lungs, where in ordinary breathing there is very little movement, and therefore but little functional activity. It has been found that the methods adopted by teachers of singing to aid the expansion of the lower (or basal) portions of the lungs, so necessary for vocal development, gradually increase to quite an appreciable extent the expansion of the apices also. These singing exercises are especially applicable, because their beneficial effects are produced quite as much during the expiratory or vocal phase as during inspiration. This is obvious, when we consider that during the sustained expiration, so essential to successful vocalization, the air cells of the lungs are kept open and tense, and in this way the conditions become more favourable for the free diffusion of oxygen to the more remote and partially collapsed portions of the apices and affected areas.

3. *The Improvement of the General Health.*—It is a matter of experience that singing improves the general health. Improved respiration results in better oxygenation of the blood, and as a direct consequence in increased vigour and power of resistance to disease on the part of the individual.

Singing and the various respiratory exercises incidental to the art may be employed as a therapeutic agent with great benefit in respect to—(1) All persons in whom, either from family predisposition or from individual weakness or abnormality of the chest, the onset of pulmonary consumption is to be feared; (2) early cases of consumption as soon as the disease becomes quiescent; (3) certain more advanced cases, where there is no active disease or ulceration going on.

The entire absence of facilities for such treatment in the case of hospital patients is much to be regretted. It would be a great boon if some public institution could be founded, either independently, or as a special department of an already existing college of singing, to which suitable cases could be referred from the various hospitals.

INSTITUTIONS FOR THE TUBERCULOUS.

VILLA GENTIANA, AROSA.

An English Sanatorium in the Alps.

THE value of the high mountain climate in the treatment of tubercular disease no longer requires proof. Whether it depends on the cold, the rarity and dryness of the air, the greater duration and intensity of sunshine, the absence of suspended impurities, the different electric potential, on each or all of these, there is no question that in suitable cases health is regained rapidly and under pleasant conditions.

VILLA GENTIANA, AROSA.

Arosa shares with its neighbours, Davos and St. Moritz, all these climatic advantages, and has special charms of its own without undue temptation to excess in sport and social gaiety.

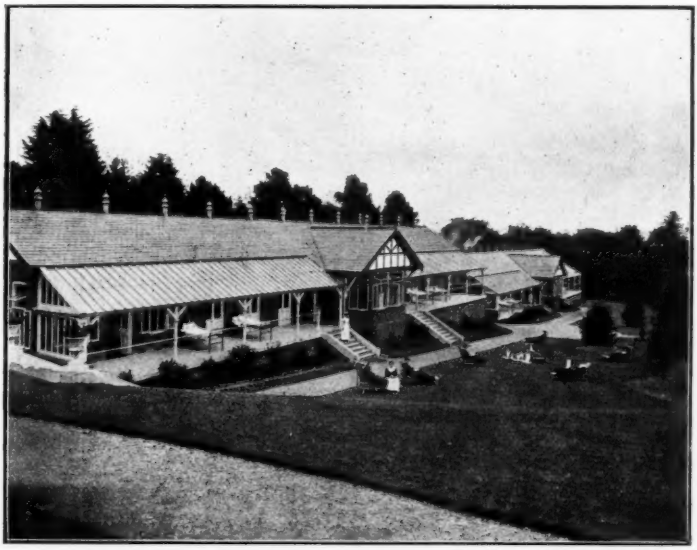
In the Villa Gentiana there is now available that constant medical supervision and skilled nursing which characterize the English sanatorium, and without which climate alone is often ineffectual. The physicians in charge have both had special experience in sanatorium methods at home and abroad, and have at command the modern technique of controlled vaccine administration.

Though primarily intended for pulmonary tuberculosis, surgical cases will be received.

Since the staff includes two English ladies, as housekeeper and nurse, patients who generally require oversight or companionship may be sent unaccompanied.

E. C. MORLAND.

BELFAST UNION SANATORIUM.



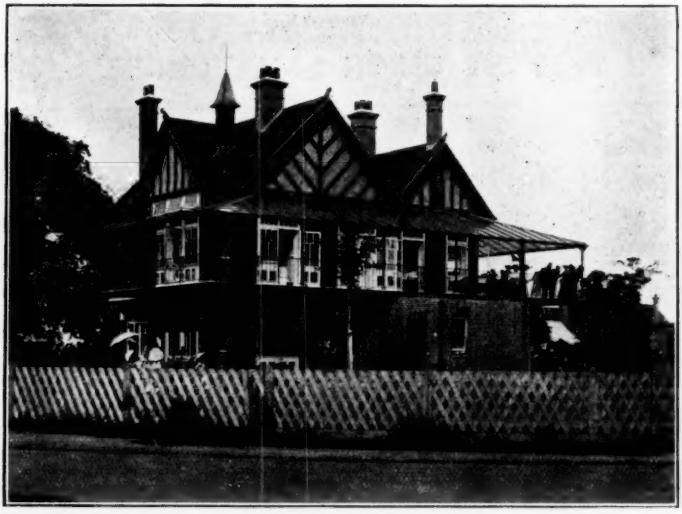
A PAVILION OF THE NEW BELFAST UNION SANATORIUM FOR CONSUMPTIVES.

THE new sanatorium of the Belfast Board of Guardians was opened on September 19 last. The mansion of White Abbey, situated five and a half miles from Belfast, with an estate of thirty-three acres, was secured for £5,000, and four pavilions, a hospital, and necessary adjuncts provided for a further cost of £32,000. Accommodation is provided for 250 patients. The four pavilions are intended for early cases. Each has twenty-five beds, and consists of a central day-room, with two wards on each side communicating by means of swinging doors. The chief features of the pavilion are shown in the accompanying illustration. There is also a hospital for 148 advanced cases. The architects are Messrs. Young and McKenzie, of Belfast.[1]

ROBERT HALL.

[1] A full description of the sanatorium appears in the *British Medical Journal* for October 5, 1907, p. 929.

SANATORIUM AT DR. BARNARDO'S GIRLS' VILLAGE HOMES, BARKINGSIDE.



SANATORIUM FOR TUBERCULOUS CHILDREN AT THE GIRLS' VILLAGE HOMES, BARKINGSIDE.

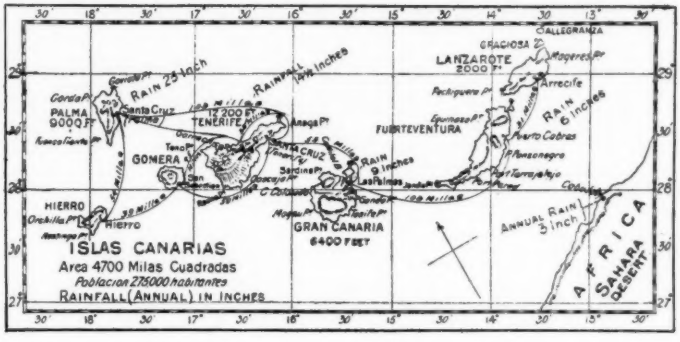
For many years the late Dr. Barnardo was anxious to secure a Sanatorium in a high and dry position, especially for the benefit of girls showing a tendency to consumption. Failing to do so, and feeling increasingly the need for such a building, one was finally erected in the grounds of the Girls' Village Homes, Barkingside, on gravel soil. This is in every way admirably suited for its purpose, and it has proved of inestimable value. Its chief exposures are to the south and west, while it is well sheltered from the north and east. The balconies surrounding it and the large French windows enable the sixteen patients to be practically always in the open and sheltered from winds. The architect was Mr. R. H. Hill, of Ingram House, 165, Fenchurch Street, and the cost £2,500.

William Baker,
Hon. Director of Barnardo's Homes.

HEALTH STATIONS.

MADEIRA AND THE CANARY ISLANDS.

For early cases of pulmonary tuberculosis who object to a British Sanatorium, and also for later half-arrested cases who require longer open-air treatment, and again for all those who stand cold badly, the wonderful climate and the facilities for treatment available in the Canaries and Madeira are worth considering. Madeira is a beautiful island, with mountains of 6,000 feet elevation, and having a rainfall of 30 inches, which keeps all green and well wooded. It is warm and sedative at sea-level, and the moisture in the air makes it very equable, 61° F. in winter, 71° F. in summer, being the mean daily averages, with a difference of 8° F., as a rule, only between night and day temperatures. The climate is somewhat relaxing, and tends to keep invalids in a state of repose, which is exactly what many consumptives require. It is an ideal place for a bronchitic case, or for a patient with chronic



gradually advancing pulmonary tuberculosis. Invalids have gone there for generations, but the accommodation has improved enormously in the last seventeen years. Reid's Palace Hotel, on the West Cliff of Funchal, is practically an open-air sanatorium in its own grounds of several acres, and is quite first class. The cog-wheel railway to the Monte Church has caused three new altitude hotels to be built, supplying a long-felt want in the island. At 2,000 feet, reached by rail in twenty minutes from the shore, a bracing mountain atmosphere is reached, and at this elevation in extensive grounds are the Monte Palace Hotel and Reid's Mount Park Hotel. The Kurhaus Santa Anna is at 1,250 feet elevation, and is fitted with electric and carbonic baths, vibration massage, etc., and has a resident physician. These high-altitude hotels are situated in charming scenery and in the pine-tree area, and although some cloud and mist may be found there in the winter months, the air is far more tonic and stimulating to a patient

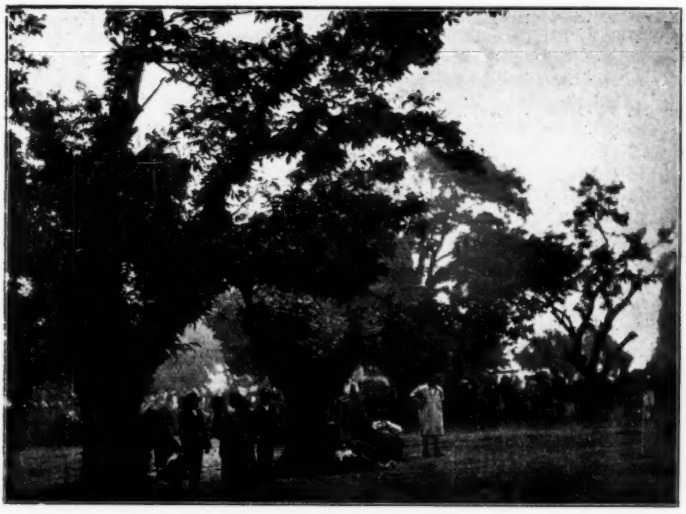
with early phthisis than the air of Funchal at sea-level. In summer the mountain climate is excellent for open-air treatment at this altitude. It is, however, even better at 4,000 feet, but here one must camp out in tents on the grassy upland sheep pastures, as there is no house accommodation. In Funchal many English live in villas, and invalids often live there if a lengthened stay is contemplated. The Portuguese servants are good. The water-supply is occasionally not quite reliable, and all water should be taken boiled for safety. There are four English physicians in Madeira, but no regular closed sanatorium. Hotel prices in Madeira range from 10s. a day down to £10 a month. It is easily reached from Southampton by the Union Castle liners in three and a half days (first-class return fare, £24), and from Liverpool by the Booth Line in four or five days (return fare, £16).

THE CENTRE OF LAS PALMAS.

THE CANARIES are warmer and drier than Madeira, with more sun, and offer a greater choice of mountain climates. *Las Palmas*, in Grand Canary, with an average annual rainfall of 9 inches, has a climate approaching the desert type, and Santa Cruz in Teneriffe is similar in its climate, but has not been developed as a health resort. A mile away from Las Palmas the Santa Catalina Hotel was built by an English company in 1890, after the model of Falkenstein Sanatorium, and here I was resident physician for ten years. It was conducted as an invalids' hotel, not as a strict sanatorium. Architecturally it is perfectly adapted for carrying out the open-air treatment. Fires or artificial heat are quite unnecessary in these islands, so that it is easy to keep patients in the open air day and night without proving too irksome to their sense of cold. All that is wanted is some wind shelter

from the northerly trade, and more sun shelter by verandas than is necessary in northern climes. Louvred shutters or persienne are fixed outside the French windows, and when shut can keep out sun or drifting rain while the windows are kept open inside them. There is plenty of English hotel accommodation, the Metropole, like the Catalina, being situated a mile away from the town, and having, similarly, its own system of drainage opening direct into the sea. Villas are not easy to obtain.

The Monte is situated six miles away from Las Palmas at 1,250 feet altitude, about one hour's drive. The climate is much more bracing, the rainfall greater—about 15 inches annual—and the country is beautiful. This district is admirable for open-air treatment, and



CATTLE MARKET AT TEROR IN THE CHESTNUT WOOD (ALTITUDE 1,800 FEET).

tuberculous patients do very well here, particularly in the spring, summer, and autumn months. There are two English hotels—one first class, surrounded by vineyards. It is a pity there is no accommodation at 3,000 feet altitude at the end of the carriage road. The mountains rise to 6,400 feet fifteen miles from Las Palmas, and are suitable for camping-out on in summer almost to their summits. The climate of Las Palmas is one of the best in the world for rheumatism and arthritis. It is good for bronchitis, but particularly bad for pure spasmodic asthma. The drinking-water supply, having been laid down by an English company in pipes, is the most reliable in the islands. There are three English physicians, an English church, golf links, tennis courts, and cricket ground at Las Palmas.

Oratava is the great health resort in Teneriffe. It is twenty-six miles

from the port of Santa Cruz by road, but an electric tram runs for three-quarters of the distance, and the rest must be driven. The climate is very similar to that of Grand Canary, but there is more shadowing by cloud, as the trade wind clouds bank up on the north side of the Peak and form a sort of parasol. There is beautiful scenery immediately at the back of Oratava, and one can ride up the Peak through the clouds hanging at about 3,000 feet altitude, and come out above them into an intensely dry and highly actinic atmosphere. The large English Grand Hotel has been taken by a German company, and is now called the Humbolt-Kurhaus. It has a German and two English physicians attached. There are several other hotels, some very cheap in their prices (down to 4s. 6d. per day).

The south side of *Teneriffe*, which is warmer, drier, and more sterile, is now provided with good accommodation for invalids at Santa Cruz. A special mention must be made of *Güimar*, at an elevation of 1,200 feet on the south side of the Peak. It has a very dry sunny climate, and yet is too high up to be enervating. Dr. Salmond has a small but admirable closed sanatorium for consumptives here, with accommodation for ten patients, and there is also a small English hotel in the village, with accommodation for about twenty. This small village community, though isolated from the gaiety which is a marked feature of Las Palmas and Oratava, is an admirable station for the treatment of pulmonary tuberculosis.

There are English hotels also at the altitude stations of *Laguna* (1,500 feet) and *Tacaronte* (1,700 feet), and from these two spots some of the most beautiful scenery in the island may be easily reached. The climate is all the year round very good for consumptives. The food-supply in the Canaries is very fair, though the native meat is not equal to the frozen New Zealand. All vegetables, bread, and milk are good, but butter and bacon must be imported from England. Las Palmas is easily reached from Southampton by the Union Castle boats in five days (first-class return, £24), and from Liverpool by the Elder Dempster boats in six days (first-class return, £15). Santa Cruz can be reached by the Union Castle and the New Zealand boats. There are many other boats calling at both ports, for a full list of which the reader is referred to Brown's admirable "Guide to Madeira and the Canaries" (London: Sampson Low and Co.), which will be found a veritable mine of useful information, both general and for invalids. The author is an arrested case of pulmonary tuberculosis who has lived in the islands for the last twenty years.

BRIAN MELLAND, M.D.

REVIEWS AND NOTICES OF BOOKS.

STUDIES IN TUBERCULOSIS.[1]

THE Reports of the Henry Phipps Institute form valuable annual contributions to the scientific study of tuberculosis. It is impossible, in a short notice, to do adequate justice to the important Third Report recently issued, but a few of the more interesting points may be referred to. A statistical summary and analysis of the patients treated at the Institute is given in the opening pages, which, among other things, gives most interesting information on the question of racial proclivity to tuberculous diseases. Commencing by saying that nearly one-half the burden of the crusade against tuberculosis is due to disease imported by foreigners, it proceeds: "The countries which send us the heaviest burdens in this respect are, in order of sequence, Russia, Ireland, Germany, England, Italy, Austria, and Scotland. The same order holds good for the burden which comes to us from the second generation—namely, the children born of immigrants." Another very interesting point is the influence of certain strains in the offspring of mixed parentage. The Irish race seems to possess a marked proclivity in this manner. Thus, "children born of mixed parentage most frequently became a burden when the union of parents was between Irish and native-born, and next in frequency when the union was between Irish and English." The same effect is noted in the unions of the Irish with any other European nationality. As regards race in the wider sense, the Celt seems to be the most liable to tuberculosis, then the Teuton, Jew, Latin, Slav, and Negro, in the order named. The high place taken by the Jewish race is not in accordance with generally received opinions; the low position of the Negro race is equally unexpected. Of course, these figures are not rigidly accurate, as they are not balanced by a comparison of population. A deeply interesting section is that which deals with "the neurological work of the year." The question of "Tuberculous Insanity" is also very thoroughly discussed. The findings of the author of this section (Dr. D. J. McCarthy) seem fairly in accord with the generally received ideas on the subject. It is interesting, however, to note that "we have not found at all that melancholia is a common type of mental disturbance complicating pulmonary tuberculosis." The prevailing symptoms on which stress is laid are "changing type of delusions from time to time, associated with failure of memory and some confusion and suspicion." Numerous cases of great interest are detailed. "The Kidneys in Tuberculosis" is the subject of a most valuable paper by Dr. Joseph Walsh. It contains records of a very valuable series of autopsies. Many will be interested in Dr. Cummins's study of "Tuberculosis in Orphan Children." Other sections of the Report deal with Albuminuria in Tuberculosis, Serum Treatment, Laryngological Work, the Relations of Micro-Organisms to Hemorrhage, etc. CHARLES H. MELVILLE, M.B., R.A.M.C.

[1] "Third Annual Report of the Henry Phipps Institute for the Study, Treatment, and Prevention of Tuberculosis." Edited by Joseph Walsh, A.M., M.D. Pp. 410. Philadelphia: Henry Phipps Institute, 238, Pine Street. 1907.

MARINE CLIMATES AND TUBERCULOSIS.

Dr. Ewart's monograph consists of an address before the Balneological Society, delivered in March last, considerably amplified.[1] The author is not only a graceful and attractive writer, but he is also profound. There is a great deal to be said, and more yet to be learned, on the subject of the influence exercised by marine climates upon the tuberculous patient, both actual and potential. Dr. Ewart approaches the matter from all points of view, and deals exhaustively with the present state of our knowledge on the subject. Of the many problems still awaiting solution he attacks a few only, but these he illuminates with some very practical advice, and adorns them with much suggestive thought.

LEONARD WILLIAMS, M.D.

CLIMATOLOGY.

The "Transactions of the American Climatological Association for the Year 1906" contain many communications bearing on tuberculosis,[2] some of them of great value. Dr. Minor's paper on "Krönig's Sign," or, as he prefers to call it, "The Apical Outline," is interesting and suggestive, though I cannot help feeling with Dr. Bonney of Denver that it has its limitation, and that, moreover, our failure to diagnose pulmonary tuberculosis is not from lack of modern facilities, but from inability to utilize old and comparatively easy methods of diagnosis. With Dr. S. G. Bonney's observations on the management of consumptives, in his paper on "Far Advanced Cases of Pulmonary Tuberculosis," any worker in this difficult branch of medicine must be in entire agreement. It is quite true, as he says, that they "constitute a class unique and peculiar to themselves, requiring the exercise of the greatest tact, judgment, and skill." He also pays a tribute to the "personal influence of the nurse," which can hardly be overestimated. The statistical paper on the "Mortality from Tuberculosis in the Neighbourhood of Sanatoria," by Dr. J. H. Elliott, is of service as bearing out the conclusions of previous observers. The volume is full of valuable and helpful things, and not the least is a paper by Dr. Norman Bridge on "The Hot Morning Bath," the use of which is especially useful for delicate patients with feeble circulation.

JANE WALKER, M.D.

PRINCIPLES OF VENTILATION.

Professor Shaw's book on the principles of ventilation should be carefully studied by sanitary authorities, architects, builders, and others, who are practically interested in the efficient ventilation of private and public buildings.[3] It is certainly the most scientific monograph on the subject we have seen. Reasoning from the analogy of the distribution of electric currents, the author shows that it is possible to regard the

[1] "Marine Climates in the Treatment of Tuberculosis." By William Ewart, M.D., F.R.C.P., Senior Physician to St. George's Hospital, and to the Belgrave Hospital for Children. London: Baillière, Tindall and Cox. 1907. Price 1s.

[2] "Transactions of the American Climatological Association for the Year 1906." Vol. XXII. Pp. lx, 303. Philadelphia: Printed for the Association. 1906.

[3] "Air-Currents and the Laws of Ventilation." By W. N. Shaw, D.Sc., F.R.S. Pp. 94. Cambridge: University Press. 1907. Price 3s. net.

behaviour of air-currents as being subject to perfectly definite laws, and further shows in a most convincing manner how these physical laws may be applied to practical ventilation. He lays special stress on the physical conditions affecting the distribution of air in a ventilated space. In dealing with convection of air-currents, he sharply differentiates between the convection of *fresh* air and that of *used* air, the density of the latter being modified by the products of combustion of the human body. He discusses the various systems of ventilation, and asserts that it is often possible to state the actual numerical values of the different elements involved in any particular system. Consideration of this important fact will often enable one to remedy an inefficient system by the superposition of some simple contrivance having the effect of modifying a portion of the circuit, and in many cases to successfully deal with ventilation problems of the greatest complexity.

R. MURRAY LESLIE, M.D.

THE PREVENTION OF CONSUMPTION.

Scientific thought and enterprise is wisely being concentrated on the prophylaxis of disease. Dr. McVail, in his recent Lane Lectures,[1] has detailed the chief benefits of public-health organization in Britain as evidenced by the success in dealing with typhus, typhoid, plague, small-pox, and other infectious diseases. Measures directed to the prevention of tuberculosis are described. Statistical evidence is also presented, showing that there is a progressive diminution in the mortality from this scourge. The results of sanatorium treatment are dealt with, and much information and many useful suggestions given. The reprint of a "Tract on the Prevention of Consumption" will be of aid to lecturers on hygiene and practical sanitarians.

Dr. S. A. Knopf's prize essay has been translated into many languages, including Hebrew, Icelandic, Japanese, Russian, and Turkish, and may be justly claimed as a world-wide classic.[2] In the fourth American edition, just published, there are valuable additions on home and school hygiene, and an interesting historical review of the anti-tuberculosis movement in the United States. This new issue should have a wide circulation. We think Dr. Knopf would do well to arrange for a special British edition, in which the last section might be replaced by a sketch of the anti-tuberculosis campaign in the United Kingdom.

Another popular work, intended "to assist the lay person to carry out his part in the section of hygienic advance which deals with the respiratory system," is Professor Leopold von Schrötter's helpful little manual, which Mr. H. W. Armit has rendered into very attractive English.[3] The work should have an extensive circulation in this country and America.

[1] "The Prevention of Infectious Diseases." Being the Lane Lectures, delivered at Cooper Medical College, San Francisco, in August, 1906, and revised for publication. By John C. McVail, M.D., D.P.H., F.R.S.E. Pp. 290. With illustrations. London: Macmillan and Co. 1907. Price 8s. 6d. net.

[2] "Tuberculosis as a Disease of the Masses, and How to Combat it." By S. A. Knopf, M.D. Fourth issue, revised and illustrated. Pp. 104. New York: Fred. P. Flori. 1907. Price 25 cents paper, 50 cents cloth.

[3] "Hygiene of the Lung in Health and Disease." By Professor Dr. Leopold von Schrötter, Director of the Third Medical Clinic of the Vienna University. Translated by H. W. Armit, M.R.C.S., L.R.C.P. Pp. 135. With 16 illustrations. London: Rebman Limited. 1907. Price 2s. net.

A SYSTEMATIC STUDY OF PULMONARY AFFECTIONS.

Among the all-too-few comprehensive modern works on diseases of the lungs, Dr. Robert Babcock's new treatise will claim a foremost place.[1] The author's "Diseases of the Heart and Arterial System" has already won distinction, and with the present volume there is admirably fulfilled a praiseworthy design of furnishing the student with a complete guide to diseases of the chest. In arrangement, presentation, illustration, and substance, a high standard has been reached. We desire, however, to particularly commend the very complete, up-to-date, and thoroughly serviceable description of pulmonary tuberculosis. Extending as it does over more than two hundred pages, and illustrated with a number of excellent photographs, it forms practically a complete monograph, and we think the author might consider the desirability of issuing it as a separate book. We specially commend the section on symptomatology and treatment. This work should be in the hands of every physician having to deal with pulmonary cases.

METABOLISM.

Every physician having to treat tuberculous patients should be acquainted with Professor von Noorden's masterly text-book.[2] Professor Walker Hall and Mr. Heinemann deserve high praise for having made this classic available to all English-reading students, and all concerned in the translation and preparation of these bulky but excellently printed volumes are to be congratulated. The first volume deals with the physiological facts and principles of metabolism, and here is given a careful presentation of the methods and results of forced feeding. In the second volume are sections on fasting and chronic starvation, overfeeding, and metabolic changes in the respiratory and circulatory organs. The student of tuberculosis will find much in these pages of suggestive and practical service. For its bibliographical references alone the book is invaluable.

TRAVEL AND THE GEOGRAPHY OF DISEASE.

Much attention is now justly being drawn to the importance of carefully selected and judiciously directed travel as a desirable prophylactic and rational therapeutic measure, especially in such affections as tuberculosis. In entering on the study of the influence of climate and geographical conditions on morbid processes, the physician cannot do better than consult Dr. Clemow's all-too-little-known but masterly monograph.[3] The section dealing with tuberculosis is particularly

[1] "Diseases of the Lungs. Designed to be a Practical Presentation of the Subject for the Use of Students and Practitioners of Medicine." By Robert H. Babcock, A.M., M.D. Pp. 809. With 12 coloured plates and 104 figures. London. 1907.

[2] "Metabolism and Practical Medicine." By Carl von Noorden, Professor of the First University Medical Clinic, Vienna. Vol. I.: The Physiology of Metabolism. By Adolf Magnus-Levy. Pp. 452. Vols. II. and III.: The Pathology of Metabolism. By Carl von Noorden, Fr. Kraus, Ad. Schmidt, W. Weintraud, M. Matthes, and H. Strauss. Pp. 1320. English issue under the editorship of I. Walker Hall, Professor of Pathology, University College, Bristol. London: William Heinemann. 1907. Price £2 12s. 6d. net.

[3] "The Geography of Disease." By Frank G. Clemow, Physician to H.M. Embassy at Constantinople. Pp. 624. With maps. Cambridge: University Press. 1903. Price 15s.

valuable, extensive data being given regarding its prevalence and manifestations in all parts of the world.

Mr. W. F. Tyler's suggestive and novel monograph[1] will interest many engaged in the conduct and practice of "open-air" methods, for it has been written with the object of showing that "the discomfort due to a muggy condition of the atmosphere might, for practical purposes, be considered as due to temperature and humidity alone; and that it is possible to determine a scale of intensity of discomfort the degrees of which are correlated to the intensity of temperature and humidity."

For lovers of the Homeland there is no more delightful district of England for early springtide than Devon and Cornwall. To those who are going, as well as to those who have been, we commend Mr. Harris's recently published attractive sketches[2] of West-Country life, with its numberless delights. The book is beautifully illustrated.

Norway and Sweden are likely to increase in popularity with English and American health-seekers as the numerous advantages for summer residence and opportunities for winter sport are more fully realized. To all contemplating a visit to Scandinavia we commend the very informing guide issued by Messrs. Cook and Son[3] and the admirable manual of the Swedish Touring Club.[4]

Elsewhere in this number the benefits of Madeira and the Canary Islands as a health station are described. All intending visitors should procure the very complete guide, prepared by Mr. A. Samler Brown, containing all that a health or holiday seeker requires to know concerning these attractive islands.[5]

The advantages of the West Indies as a recruiting-ground for the mentally fagged and bodily jaded, and a health resort for certain tuberculously disposed cases, are now being clearly recognized, and, with the existing excellent facilities for hygienic and comfortable travel, an increasing number of visitors will be turning westward to the Caribbean Islands, and especially to the "Queen of the Antilles." To all such we would recommend Mr. John Henderson's amusing and informing sketches of Jamaican life, rendered additionally attractive by numerous excellent coloured reproductions of vigorous and artistic paintings by A. S. Forrest.[6]

Rome is also becoming popular as a winter resort, and for many undoubtedly offers irresistible attractions. All intending visitors to the

[1] "The Psycho-Physical Aspect of Climate, with a Theory concerning Intensities of Sensation." By W. F. Tyler, F.R.Met.Soc., Assoc.Inst.C.E. Pp. 45. With 26 charts. London: John Bale, Sons and Danielsson, Ltd. 1907. Price 5s. net.

[2] "My Devonshire Book: in the Land of Junket and Cream." By J. Henry Harris. Pp. 174. Illustrated. Plymouth: *The Western Morning News* Co., Ltd. 1907.

[3] "Cook's Handbook to Norway and Denmark, with Iceland and Spitzbergen." Sixth edition, revised and enlarged. Pp. 304. With maps, plans, and vocabulary. London: Thomas Cook and Son. 1907. Price 1s. 6d.

[4] "Sweden." Edited by the Swedish Touring Club. Pp. 238. With 17 maps and 7 plans. Second revised edition. London: Thomas Cook and Son. 1906. Price 4s.

[5] "Brown's Madeira, Canary Islands, and Azores. A Practical and Complete Guide for the Use of Tourists and Invalids." With 20 coloured maps and plans, and numerous sectional and other diagrams. By A. Samler Brown. Eighth and revised edition. London: Sampson Low, Marston and Co., Ltd. 1906. Price 2s. 6d.

[6] "Jamaica." Painted by A. S. Forrest. Described by John Henderson. Pp. 179. London: Adam and Charles Black. 1906. Price 6s. net.

Imperial City would do well to consult Dr. Welsford's practical guide, which contains just the detailed information a health-seeker requires.[1] Particulars are given respecting the prevalence of tuberculosis.

Through the courtesy of Dr. Nietner, the Secretary-General of the recent International Congress of Hygiene and Demography, held at Berlin in September last, we have been furnished with the series of valuable volumes published in connexion with this great gathering, and to those interested in the medico-sociological work of Germany's capital we would particularly commend the useful descriptive manual, printed in German, French, and English, which describes the chief scientific institutions of Berlin.[2] Much praise is due to the enterprise which led to the preparation of several *Festschrifts*, which will be of great value for purposes of reference.[3]

MANUALS FOR MEDICAL PRACTITIONERS.

Several important additions have been made to the very practical "Oxford Medical Manuals." Mr. Waggett's book on diseases of the nose[4] is a particularly helpful handbook, giving, as it does, in clear and concise form excellent descriptions of modern methods and measures now employed in this most important speciality.

Mr. Hunter Tod's book on diseases of the ear[5] is a well-arranged, illustrated, and thoroughly workmanlike production, containing just the information and direction desired by the practitioner, and including descriptions of tuberculous affections of the ear.

Mr. Corner's manual on affections of the male genitals is an excellent monograph, concise, yet comprehensive, eminently serviceable, and effectively illustrated.[6] It contains a thoroughly reliable account of tuberculous disease of the testicle, with a brief account of its chief features when occurring in children.

Wellcome's neat, compact, and comprehensive pocket-book[7] for 1908, with its ingenious exposure calculator and arrangement for records, is a vade-mecum which no photographer, scientific or artistic, can afford to be without.

[1] "Wintering in Rome." By A. G. Welsford, M.D., B.C., F.R.C.S., D.P.H. With an Introduction by G. Sandison Brock, M.D., C.M., F.R.S.E., Physician to the British Embassy at Rome. Second Edition. Pp. 104. With illustrations. London: The Health Resorts Bureau, 27, Chancery Lane, W.C. 1907.

[2] "Hygienischer Führer durch Berlin." S. 470. Berlin: Verlag von August Hirschwald. 1907.

[3] "Medizinische Anstalten auf dem Gebiete der Volksgesundheitspflege in Preussen." S. 445. Mit 1 karte, 2 Plänen und 128 Abbildungen. Jena: Verlag von Gustav Fischer. 1907.

"Das Deutsche Reich in Gesundheitlicher und demographischer Beziehung." S. 331. Berlin: Verlag von Puttkammer und Muhlbrecht. 1907.

[4] "Diseases of the Nose." By Ernest B. Waggett, M.A., M.B., B.C. Pp. 282. With 89 figures. London: Henry Frowde, and Hodder and Stoughton. 1907. Price 5s. net.

[5] "Diseases of the Ear." By Hunter Tod, M.A., M.B., B.C., F.R.C.S. Pp. 317. With 18 plates and 15 figures. London: Henry Frowde, and Hodder and Stoughton. 1907. Price 5s.

[6] "Diseases of the Male Generative Organs." By Edred M. Corner, M.A., M.B., B.Sc., M.C., F.R.C.S. Pp. 279. With 41 figures. London: Henry Frowde, and Hodder and Stoughton. 1907. Price 5s. net.

[7] "Wellcome's Photographic Exposure Record and Diary." Pp. 272. London: Burroughs, Wellcome and Co. 1908. Price 1s.

PREPARATIONS AND APPLIANCES.

THE TUBERCULIN-OPHTHALMO REACTION.

SINCE the introduction of tuberculin as a diagnostic agent many attempts have been made to simplify its method of application and to overcome the objections to hypodermic injection. The investigations of von Pirquet, Wolff-Eisler, and Vallée deserve special notice.[1] It is, however, to Professor A. Calmette of Lille that we owe the popularization of a method which, whatever may be its limitations, seems at present to offer the simplest, safest, and most reliable diagnostic test for tuberculosis yet available.[2] We have employed it in a number of cases of infants, children, and adults.[3] The procedure is one which any practitioner can easily employ. Opinions hitherto published are practically all in its favour.[4] It is only by extended trial that we can hope to ascertain the precise value to be placed on the results obtained. In this, as in so many other tests, it would seem that a negative reaction must not be accorded positive value. Meanwhile, it may be hoped that in sanatoria, schools, and other institutions the reaction will be tested systematically and scientifically.

THE CONGESTIVE TREATMENT OF PULMONARY TUBERCULOSIS.

Much benefit has resulted in certain forms of tuberculosis involving the extremities and other parts from the establishment of a state of passive hyperæmia of the affected structures. It was inevitable that attempts should be made to apply the principle of Professor Bier's method to tuberculosis of the lungs and respiratory passages.[5] With this object in view, KUHN'S SUCTION MASK has been invented, and extensively employed in German clinics. We have recently tested this appliance, and are of opinion that it deserves consideration and trial. It certainly is at least a useful means of improving the respira-

[1] See *Lancet*, December 7, 1907, p. 1629.

[2] Calmette, A.: "Sur un nouveau procédé de diagnostic de la tuberculose chez l'homme par l'ophtalmo-réaction à la tuberculine," *Gazette des Hôpitaux*, June 25 and August 8, 1907.

[3] Calmette Tuberculin Test is supplied in this country by W. Martindale, 10, New Cavendish Street, London. W. Price: Liquid form—single tubes (two or three trials), 1s. 6d., or six tubes in box, 7s. 6d., post free; dry form (sufficient for ten trials), 3s.

[4] For bibliographical references see—Stephenson, S.: "The Ophthalmo-reaction of Calmette," *The Ophthalmoscope*, September, 1907, p. 509. MacLennan, W.: "Observations on the Ophthalmo-reaction to Tuberculin," *British Medical Journal*, December 7, 1907, p. 1642.

[5] Professor Victor Schmieden of Berlin contributes an excellent summary of Professor Bier's system of artificially produced passive hyperæmia in the recently published admirable "Index of Treatment," edited by Robert Hutchison, M.D., F.R.C.P., and H. Stansfield Collier, F.R.C.S. Bristol: John Wright and Co. 1907. Price 21s. net.

tory action of defective breathers, and whether it proves of permanent value or not in phthisical cases, it is likely to be of material assistance in dealing with patients of restricted respiratory powers, whether arising from physiological deficiencies or actual disease. We consider that Kuhn's Suction Mask deserves an unprejudiced trial in this country, and we trust it will be carefully tested in our hospitals and sanatoria for diseases of the chest.[1]

THE STRUCTURE OF SANATORIA AND HYGIENIC HOUSES.

In our last issue we presented a number of opinions as to the best means for constructing economic sanatoria. Our attention has recently been drawn to a new method for providing permanent hygienic buildings at a reasonable cost, a system of concrete construction, which is very lasting, and requires practically no repair. Pavilions, chalets, and hygienic residences thus constructed, and having tiled roofs, may be finished on the outside with rough cast or in many other equally attractive ways, and inside they can be plastered and papered, painted, distempered, or panelled in a great variety of materials. They are capable of exactly the same internal arrangements as any ordinary brick houses, and have the advantage of costing considerably less, while being in no single respect inferior. The system, we understand, has been employed for some time in America, where it has been found quite faultless, and is rapidly extending. The cost, we are informed, will be found to compare very favourably with any other construction of equally substantial character.[2]

A NEW BED AND FOOT WARMER.

Every tuberculous patient who has attempted open-air treatment in this country and many other invalids in this and other lands know how essential are means for warming the couch and bed. To all such, and to those responsible for the conduct of sanatoria, we commend the new Coates' Patent Bed and Foot Warmer.[3] It is a double tin or copper flat vessel, having capacity of 6 pints, and weighing, when filled, 12 pounds. When opened the whole length, it forms an ideal bed-warmer. Each half can be used separately for different beds or for children's cots, or may be employed as two foot-warmers.

SMOKE AND SUNLIGHT.

These are antagonistic influences. The former makes and perpetuates disease, while the latter is powerful in the prevention and arrest of many morbid affections. This is particularly true in regard

[1] See article by Staff-Surgeon Dr. E. Kuhn, "On the Mechanical Treatment of Pulmonary Tuberculosis by Hyperæmia and Acceleration of the Lymph Stream induced by the Pulmonary Suction Mask," *Folia Therapeutica*, October, 1907. London: John Bale, Sons and Danielsson, Ltd. Price 1s. Kuhn's Suction Mask is supplied in sizes suited for men, women, and children (price 20s. each), by the Roborat Company, 8, Harp Lane, London, E.C.

[2] For full particulars, apply the Wire Wove Roofing Co., 108, Queen Victoria Street, E.C.

[3] Supplied by Messrs. Thomas Christy and Co., 4, 10, and 12, Old Swan Lane, Upper Thames Street, E.C. (Price: Best block tin, 8s. 6d.; planished copper, 22s. 6d.)

to tuberculosis. All engaged in the campaign against the "great white plague" should study Mr. Graham's able, interesting, and most informing brochure on the smoke problem,[1] and might well support the Coal Smoke Abatement Society's efforts.[2] Mr. Graham's work is thoroughly practical, and contains much valuable advice on the construction and employment of coal-grates, gas, electricity, and the restriction of our national coal supply.

We have recently been favoured with specimens of "Carbo," a new form of smokeless fuel which is worthy of trial.[3]

"Coalite" is another form of smokeless fuel said to be suitable for burning in an open grate of ordinary construction.[4]

Among the many modern grates now constructed on rational principles, we wish to draw special attention to the BOSTEL FIREPLACE[5] as being not only well adapted to the requirements of the sanatorium and hospital, but particularly serviceable for the private house.

DENTAL HYGIENE.

Many consumptives are the subjects of oral sepsis, secondary to decaying teeth and pyorrhœa. It is unfortunate that both in the diseased as well as in the normally healthy the condition of the mouth is commonly neglected. Recognizing the need for educational advance in regard to this matter, the School Dentists' Society have prepared a series of DENTAL HYGIENE CHARTS.[6] They have been prepared with great care, are particularly accurate, and most effectively coloured. We strongly recommend these admirable charts to all school medical officers and teachers.

"TUSCO" LIQUID DENTIFRICE is a particularly elegant and effective application for the teeth and gums, and deserves to be known and used in all sanatoria.[7]

A NOVELTY FOR CHILDREN.

The new BABY CARRIER is a most novel, ingenious, and effective invention, and well deserves to be known by all who are in any way interested in or responsible for little children.[8] It is extremely simple, consisting merely of a strong holland bag-seat, with deep braided edges, back rests, rubber-covered flexible handles, and strong webbing slings, readily adjustable. We have tested this contrivance, and can thoroughly recommend it.

[1] "The Destruction of Daylight: a Study in the Smoke Problem." By John W. Graham, M.A. Pp. 152. London: George Allen. 1907. Price 2s. 6d. net.

[2] The reports and various pamphlets of the Coal Smoke Abatement Society may be obtained from the secretary, Mr. Lawrence W. Chubb, 25, Victoria Street, Westminster, S.W.

[3] "Carbo" is supplied by the Gas Light and Coke Company, Horseferry Road, Westminster, S.W.

[4] For particulars apply Coalite, Ltd., 3, London Wall Buildings, London, E.C.

[5] Manufactured by the Coalbrookdale Co. London office: 15, Rathbone Place, Oxford Street, W.

[6] Published for the School Dentists' Society by W. and A. K. Johnston, Ltd., 7, Paternoster Square, E.C. (Price: Set of three charts, mounted on cloth and rollers and varnished, 30s.; facsimile reductions, with descriptive letterpress, 1s. 6d.)

[7] Supplied by "Tusco" Chemical Co., 10, Adam Street, Strand, W.C.

[8] Supplied by A. W. Gamage, Ltd., Holborn, E.C. (Price 5s.; with slings, 1s. 6d. per pair extra.)

A CHART AND CASE-PAPER HOLDER.

The Rockwell-Wabash Loose Sheet-holder[1] should prove of service in sanatoria and hospitals, and will be helpful to many in private practice as an effective and convenient means whereby notes, charts, diagrams, and the like can be automatically clamped in strong and artistic covers.

INHALATIONS.

In many forms of laryngeal and pulmonary disease the local application of medicated vapours is of conspicuous service. Among the numerous forms of apparatus now available, the "Universal Vaporizer" and "Aerizer" deserve special commendation. By their means medicated solutions, an admirable series of which, under the name of "Neboline" Compounds, are now available, may be converted into such a fine state of subdivision that no condensation is apparent, and the selected drugs are speedily brought into intimate contact with the affected parts.[2]

MEDICAMENTS.

Cellotropin, otherwise mono-benzoyl-arbutin, is a light, white, crystalline powder with slightly aromatic and bitter taste, insoluble in water, dissolving in alcohol, and has been recommended as a useful agent in the treatment of tuberculosis.[3] Professor Aufrecht has tested it on a number of tuberculous animals with good effect.

In the secondary and associated anæmias commonly met with in tuberculosis, a bland and easily assimilable preparation of iron is often of considerable service. Among the best, and which we have employed with conspicuous advantage, are the so-called Hemaboloids. In the arseniated form with strychnine this preparation is an admirable tonic and hæmatinic for consumptives and other tuberculous cases.[4]

Pumiline, consisting of distilled terebinthenate oils, both in the form of "Essence" and "Jujube," we have found an excellent preparation for catarrhal affections of the respiratory passages, and in cases of fœtid bronchitis, bronchiectasis, chronic tuberculous disease of the lungs, and cases of slight and persistent pulmonary hæmorrhage, it will be found to be of much service.[5]

Glyco-Thymoline is an elegant alkaline, antiseptic, deodorizing preparation for use in oral sepsis and dental derangements, and as a spray or wash in many naso-pharyngeal conditions it is unsurpassed.[6] We have found it of service in states of gastric irritability, and it is said to be of real benefit in sea-sickness.

[1] Supplied in various sizes, at prices from 2s. to 5s. 6d., by the Rockwell-Wabash Co., Ltd., 69, Milton Street, London, E.C.

[2] The Universal Vaporizer (price 12s. 6d.) and the Aerizer (price 6s.), and "Neboline" Compounds (price, 1-ounce bottles, 1s. to 3s. 6d. each), are supplied by Messrs. Oppenheimer, Son and Co., Ltd., 179, Queen Victoria Street, E.C.

[3] Full particulars concerning Cellotropin may be obtained from Messrs. A. and M. Zimmermann, 3, Lloyd's Avenue, London, E.C.

[4] Supplied by Messrs. Andrus and Andrus, 46, Holborn Viaduct, E.C., representing the Palisade Manufacturing Co., of New York.

[5] Supplied by Stern and Co., Manufacturing Chemists, Cheadle Hulme, Manchester.

[6] Manufactured by Kress and Owen Co., 210, Fulton Street, New York, and supplied by Thomas Christy and Co., 4, 10, and 12, Old Swan Lane, Upper Thames Street, E.C.

NOTES AND NOTICES.

ANTI-TUBERCULOSIS TUITION.

MUCH ingenuity is being displayed by those engaged in the anti-tuberculosis campaign, in order to educate the unheeding and negligent

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THE PREVENTION OF CONSUMPTION.
By the Medical Officer of Health for the Burgh of Renfrew.
1906
JANUARY
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OLD CROSS
NEW CROSS

public in measures essential for the prevention and arrest of consumption. A very commendable device has been introduced by Dr. W. G.

Stevens, the Medical Officer of Health for Renfrew, N.B., through whose courtesy we are enabled to reproduce his striking illustrated educational almanac.

EXHIBITIONS, CONFERENCES, AND CONGRESSES.

The Anti-Tuberculosis Movement is finding many new and effective ways for educating professional and public opinion. In Ireland most successful exhibitions and courses of lectures have been held in Dublin, Belfast, and Limerick, and are to take place in other centres. This enterprise has received the approval of His Majesty the King, and is being ably encouraged by Her Excellency the Countess of Aberdeen and supported by many members of the medical profession and others interested in the arrest of this scourge of humanity.

In America Travelling Tuberculosis Exhibitions have been found to be of considerable value.[1]

The recent International Tuberculosis Conference at Vienna adopted an "International Classification" for cases of pulmonary tuberculosis.[2]

The forthcoming International Anti-Tuberculosis Congress to be held at Washington from September 21 to October 12, 1908, promises to be of world-wide interest and importance. Addresses are to be delivered by such well-known experts as Dr. R. W. Philip, of Edinburgh; Dr. Theodore Williams, of London; Dr. Newsholme, of Brighton; Dr. C. H. Spronck, of Utrecht; Dr. Karl Turban, of Davos; Dr. Gotthold Pannwitz, of Berlin-Charlottenburg; Professor von Behring, of Marburg; Professor A. Calmette, of Lille; Dr. Maurice Letulle, of Paris; and Professor Kitasato, of Tokyo. Dr. John S. Fulton, the Secretary-General, 810, Colorado Buildings, Washington, has kindly promised to let us have an article for our next issue indicating something of a forecast of the coming Congress. In view of this great international gathering we are preparing a special volume which will deal with all aspects of the Tuberculosis Problem relating to Infants and Children.

A ROBERT KOCH MEMORIAL.

A quarter of a century has passed since the tubercle bacillus was discovered. The whole civilized world will welcome the movement to honour Robert Koch by the establishment of an institution for scientific research into all means for the arrest of tuberculosis. Full particulars may be obtained from the treasurer to the fund, Dr. Paul von Schwabach, S. Bleichroder's Bank, 63, Behrenstrasse, Berlin.

[1] See Fourth Annual Report of the Committee on the Prevention of Tuberculosis of the Charity Organization Committee of the City of New York for the year 1905-1906.

[2] *Monatsschrift der Internationalen Vereinigung gegen die Tuberkulose*, November, 1907. Berlin: Rudolf Mosse, 46-49, Jerusalemer Strasse, S.W.